

HUMAN CAPITAL:
AN ANALYSIS OF THE INTERGENERATIONAL
INVESTMENT DECISION

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As bidden by God, I make this acknowledgement:

Every event must needs have an origin and every building a builder. Verily, the Word of God is the cause which hath preceded the contingent world---a world which is adorned with the splendors of the Ancient of Days, yet is being renewed and regenerated at all times. Immeasurably exalted is the God of Wisdom Who hath raised this sublime structure (Baha'u'llah).

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Praise be to God, the Revealer of the Ancient Beauty!

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This dissertation is a study of the intergenerational decision to invest in those factors which support the formation of human capital. It is comprised of three papers, each of which discuss a different aspect of the problem. The context is the decline in investment in children in America based on measurements of child welfare: does this represent a shift in the willingness of Americans to invest in the next generation, or is something else responsible?

The first chapter establishes the theoretical aspects of the decision, both from a neoclassical and an institutional perspective. It points to the possibility that a shift in preferences has caused individuals to think more of their own needs and wants and less on the needs of the next and future generations. It indicates the seriousness of the long

term consequences to the aggregate economy if Americans decide to withdraw their support for economic and institutional factors which aid the next generation to become economically viable.

The second chapter presents a dynamic mathematical model of the effects of changes in the subjective rate of impatience on aggregate economic growth. It uses optimal control theory and the phase diagram to suggest possible growth paths for the American economy for given rates of subjective impatience. It shows how per capita capital to labor ratios would fall over time if children do not receive necessary factor supplies for human capital formation, and concludes that such a drop would reduce the standard of living for Americans over time.

The third chapter is an empirical analysis of how family background components affect the odds that their children might become involved in drug and alcohol use, criminal activity, sexual activity and/or antisocial behavior. Each of these risky behaviors is regressed in turn on elements of family social capital to measure the probability that a specified cohort will have difficulties with these risky behaviors depending upon the level present of the specified family capital characteristics.

CHAPTER 1 INTRODUCTION

Recently, the Florida legislature, following the lead of other state legislatures, decided that juveniles who commit serious crimes should be treated as adults in the criminal justice system. The reasoning went, "If you do adult crime you will do adult time." But if a child commits an "adult" crime, does he or she think and reason like an adult? Has there been a sudden acquisition of a strong sense of the future consequences of present actions? Has the childlike condition of impatience and inability to conceive of reality beyond a few days or weeks or months suddenly disappeared, just because the judicial system has recategorized a child as an adult? How will placing a child felon, with his or her short planning horizon, into a system that takes months or even years to grind out its results, reduce juvenile crime?

Is the willingness of state and local governments to increase the punitive atmosphere for children another example of a trend in society to make children more responsible for themselves, while society reduces its own responsibility for them? Data at the national level presented in this study suggest that the situation for children has deteriorated in some important ways in the last few decades. In the recent past the elderly were the poorest cohort, but now children are the poorest cohort in American society. Evidence suggests that children are increasingly suffering from the consequences

of violence, neglect, molestation and crime, while public programs to support children in specific ways are losing their funding.

The home environment for children has become more complex in recent decades. The options of divorce and of parenthood without marriage are more exercised today than in times past. What effect might this have on the psychological and material endowments children receive, and how might this affect their chances for a successful economic and social life?

The purpose of this study is to analyze the collective decision of one generation to invest in their offspring, and the economic impact of changes in this decision, both upon their offspring's future viability and welfare, and upon the national economy over time. Economics, with its emphasis on incentives---rewards and punishments, motivating individual behavior, offers an analytical framework for this topic at once accessible and quantifiable. It sees personal actions and interactions as exchange acts of some form, and identifies the exchange act as the most fundamental of human acts. Economics is the science of exchanges. The analysis of whether the present generation of Americans has altered its willingness to invest in the next generation is carried out within the context of applied resource economics because the formation and development of human capital, i.e., the forming of the next generation into independent, self-supporting adults, is of primary importance for any economy, whether of a nation, region, village, tribe, family or individual.

The question for applied resource economics is threefold: (1) Since tastes and preferences are central to any discussion of why certain interactions of individuals have

changed, what does economics say about the formation and changing of tastes and preferences. Also, if investing is important, how do individuals become investors, and what are the possible complications in understanding the need to invest in human capital, i.e., are there public good/externality issues that need to be addressed? (2) How might a change in the willingness of the current generation to invest in the next generation be mathematically modeled? Can such a model give an indication as to the long term and dynamic aggregate economic consequences of such a change, and can changes in tastes and preferences be specifically represented? (3) Can it be empirically shown that what children receive in the form of investment bequests and maintenance from the generation in charge of them affects the actions these children will take as they mature; specifically, how would a specific home environment affect the child's propensity to engage in drug and/or alcohol use, sexual activity, criminal activity, and street gang participation? This last establishes a link between the nature of the investment in children and their future actions, both in the economy and in society.

Various economic topics are seen as having particular relevance to the above questions. These are organized in the dissertation as separate papers, each using a particular analytic technique and each addressing one of the above three questions. These papers are capable of being separately understood; but taken together, they form an overall approach to the analysis of this complex social and economic question.

The first paper lays out the theoretical principles that come into play when research into this topic is carried out, both within and without the neoclassical paradigm. The object is to provide a context in which analyses of the question may take place, and

to identify those existing theories which have direct bearing on the topic. An explanation is offered as to why individuals and the public at large finds it difficult to understand the constant need to support the formation of human capital. The second paper mathematically models scenarios where societal commitment levels to the support for human capital formation factors are varied, and by extension, capital formation, wealth creation and dynamic consumption levels. A way to specifically represent changing tastes and preferences of one generation is combined with changes in its willingness to provide bequests for the young, dependent generation. The third paper is an empirical analysis. Background information regarding the levels of family environmental components are gathered for an eighth grade cohort. Four years hence their involvement in sexual activity, criminal activity, drug and alcohol use and street gang participation are measured. These are regressed in turn on the set of family background components to measure the strength between these background components and the cohort's probability of becoming involved in any of these at-risk behaviors. The object is to see how important such things as parental oversight, the parents being married, the presence of a father and/or a mother in the child's life, and the level of family money income are to the future success of children in avoiding behaviors that risk their future chances for economic and social viability.

This work is based on the theoretical findings of neoclassical and institutional economics. The growth theory aspects of this study relate directly to other growth theory research that has been undertaken for over sixty years. It is also in line with other empirical research that has attempted to relate private decisions to public costs and benefits.

Together these three approaches provide an analysis of the dynamic consequences of investment reductions in the formation of human capital, i.e., in enabling children to become independent, economically successful adults, and provide empirical evidence of the importance of specific facilitative factors in the formation of the human capital requiring investments of the independent generation for the generation dependent upon them. The explanation as to why individuals and the public at large are altering their behavior that is offered is plausible, and relies on what economics has shown about human behavior.

CHAPTER 2

INVESTING IN THE FUTURE: AN EXPLORATION INTO THE DYNAMIC CONSEQUENCES OF A QUASI MARKET FAILURE

Introduction

It is a truism that the future of a society is contained in the future of its children. If it can be shown that all wealth is created from human capital, and that a dynamic, integrated, multi-stage process of investment in human capital is required to form it, it means that it is in the present cohort of children that investments must now be made if there is to be wealth for future generations.

It is often difficult to identify specific investments in children intended to increase the number of economically and socially viable individuals; even when there is general agreement as to the efficacy of a specific investment plan its quantification and timing to assure optimal results are speculative. However, some investments in social and family capital are known to benefit the process of maturation in children by increasing their welfare, while their lack is known to diminish the probability of children becoming mature adults (Kline 1990; Maston et al. 1993).

The two-parent family, the historical benchmark for a nurturing environment for child development, has declined in numbers in the past decades. In 1970, 87.1% of children lived in households with both parents; by 1990, this was true for only 71.9% of households (Rawlings 1994). By 1993 the figure was 69.8% (Rawlings 1994). In

1970, the percentage of children living with just one parent or one who had never been married was 6.8%; by 1990 this percentage had risen to 30.6% (Lugaila 1992; Saluter 1993). These data indicate that living arrangements have become more complex for children, and might possibly be stressing them in ways little understood (Wallerstein 1989). There is evidence that these living arrangement complexities has resulted in diminished material and psychological security for children (Wallerstein 1989).

Other data indicate that of all population groups, young children are most likely to be living in poverty (Segal 1991). If they are living with both parents, 19.9% are living in poverty; if they are living with just their mother as head of household the percentage living in poverty jumps to 53.4%; and 58% of mother-child families have been awarded child support payments (Lugaila)¹.

In a comparison with nine other industrialized nations, including Japan, Western European nations, and Canada, the United States ranked highest in the number of out-of-wedlock pregnancies, teens giving birth, divorce, children living in poverty, and ranked in the bottom third for child care quality, at the bottom for preschool program availability, and seventh in the percentage of youth graduating from secondary school (Bronfenbrenner 1992).

It is probably impossible to isolate what effect on society these environmental changes have had on the maturation process of children. According to the *Uniform*

¹ While there has been some increase in the willingness of the courts to award custody of the children to the father rather than the mother, this is still an exception and quite unusual. According to Rawlings, in 1993 the number of households maintained by mothers was 25.9%; the number maintained by fathers was 4.3%.

Crime Reports (1993) the number of youth under 18 years of age involved in violent crime rose 67.6% from 1984 to 1993, compared with 46.2% for those 18 years or older. For all offenses charged for the same years there was a 22.2% rise for those under 18 years old, compared with a 17.6% rise for those 18 and older. Violent crime has increased from 1989 to 1993 by 8.5% for the 18 years and older group, while for those under 18 years it surged upward by 36%. In fact the crime index for the 18 years or older group fell 4.5% from 1989 to 1993, while for the under 18 year-old group it has risen 6.7% for the same years (Uniform Crime Reports 1993).

An international comparison of mathematics test scores of nine-year-old children places U.S. children next to the bottom, below Canada and above Slovenia (National Center for Education Statistics 1993). According to many sources the amount of homework assigned and done by American students is less than that in most other developed nations. While not in itself a measure of educational quality, homework time is a measure of the total amount of time students spend on their school subjects. It is reasonable to expect there to be a positive relationship between success in school and time spent on school work, *ceteris paribus*.

Are American children today experiencing too much and learning too little? Are parents unable or unwilling to do as much for their offspring as was done for them and others in past generations? When it comes time for the next generation of Americans to assume positions of responsibility and independence, will there be too few able to do so? In that case, how will sufficient wealth be created for their---and our---future needs?

* * *

Following is an enquiry into the conceptual roots of an apparent shift by Americans over the last few decades toward more current consumption and away from current investment, particularly investment in the young. This enquiry reveals that under certain conditions, an economy might treat the public question of economic system maintenance and growth as a private one, and will not adequately prepare for its own future requirements. Because the privately made decision to invest in human capital formation factors has external ramifications and profound consequences for the entire society, the incapacity of the market to properly equate marginal return with marginal costs constitutes a market failure.

There has been much discussion of the positive external effects of education in society (Browning & Browning 1987; Mincer 1958), but this enquiry looks at the public goods characteristics of human capital once formed, and what its public goods status predicts about the public support of a broad set of human capital formation investments, of which education investments is a subset. Whether the problem of how to maintain adequate supplies of human capital formation is characterized more as a problem of externalities, as a public goods problem, or as a factor supply problem, the market failure implications of under support in human capital formation investments exists all the same.

The primary objective of this paper is to delineate the intellectual foundations of the human capital formation problem, so that empirical research may be undertaken on

this topic. The enquiry is framed as a dynamic problem of human capital formation tied to investment decisions. Central assertions are that tastes change intergenerationally; that preferences change from the influence of institutions in society, including, but not limited to, family, school, cultural structures, social mores, religious traditions, work ethics, media, decision rules, etc.; and that the belief that tastes do not change over time is not reasonable in light of the assumed variability of all inputs in the long run.

As a final assertion, there is no reason to expect that the rate of change in intergenerational tastes will follow a linear process, a very restricted model class. It is more plausible that the rate of change in intergenerational tastes will be nonlinear, possibly exponential, because those changed by institutions come themselves to be employed in these same institutions where the influence of their tastes is fully incorporated within the workings of the institution itself.

Several topics will be discussed which focus on how each emerging generation is transformed into a new cohort of market agents, fully capable of adding to society's wealth; and how information streams, tastes and preferences interact with this process. There is little difficulty modeling these topics within the neoclassical paradigm until it comes to the discussion of tastes, preferences, institutions, and other intangible human ties. However, the additional explanations provided by transcending the neoclassical paradigm are still in accord with the core concepts of neoclassical economics, specifically, that individuals respond to incentives, and that they choose what they feel is most advantageous to themselves in whatever set of circumstances they encounter.

Tastes and Preferences and the Role of Institutions:
From Child to Adult.

The reality of being a child is one of legal, psychological and physical dependence upon care givers. Children can learn from direct experience such things as not touching a hot clothes iron or not sitting on anthills. But many things to be learned, such as the negative future consequences of cheating, or taking drugs, are more abstract and cannot be readily demonstrated by direct means. Parents are continually challenged to pass on such lessons as the value of work and self-sacrifice, of the need to be courteous to others, to save money, etc. These lessons involve a sense of rewards and punishments *in the future*, a pure abstraction for any child who, by nature, is both self-centered and now-centered.

That these lessons and many others must be successfully taught in order for each generation to mature seems obvious to most. After all, the inculcation of such lessons is associated with the station of adulthood, where economic independence is achieved and life-long plans are carried out, plans involving investments of both time and money. But what might happen if lessons involving a sense of future outcomes are not learned?

Take for instance the need to work for future rewards. This concept rests at the core of all economic progress. The learned behavior that constitutes the process of investment is dependent upon understanding this concept. If the concept of future rewards for present sacrifices is not comprehended, how could any investment ever be undertaken? On what basis would it be rational to forgo current wants for the promise of future rewards? Obviously, those who do invest understand this process and undertake

it when economic conditions are favorable. But market agents differ in their investment plans according to their tastes and preferences.

Tastes are assumed to be exogenously supplied in neoclassical economics and are not treated within the paradigm except as a source of unalterable data (Stigler and Becker 1977). Preferences could be considered a tangible expression of those tastes. Although certain elements of early childhood have been identified as influential on the formation of tastes, such as family background characteristics, economic status and social capital (Smith, et al. 1995), there is little agreement concerning how these and other elements are actually incorporated in the maturation process of the individual. Reder (1979) states that tastes are formed at a very young age in the individual. In his essay on the positive role of morality in economic society, he says

If a community were collectively rational it would try to raise its moral tone. To effect this, it would be necessary to *produce* transactors who were more moral. (Use of punishments and rewards is no substitute; they affect behavior *given* preference functions. The problem is to alter the preference functions themselves.) To understate the matter, the technique of producing better and worse "character" in individuals is not well understood. However, there is strong consensus which I think would be widely shared in all societies, that character is somehow produced in childhood and youth; i.e., in the "formative years." Accordingly, one would expect that the Central Authority (not necessarily the state), would be much concerned in this production process; and it is and has been. (p. 144-5)

With the strong axiom of revealed preference (SARF) assuming that purchase decisions require that utility functions have been formed and are well behaved (Varian 1992), then logically tastes must have been present for utility functions to have been

formed (Chalfant and Alston 1988). Reder's "character" has tastes as a foundation stone, and preferences as their expression. But since tastes and preferences are both individual and aggregate demand determinants, just as are income, the number of demanders, and expectations, they are liable to shift when the long run is being considered. Over time, the autonomous market agent has his or her tastes influenced by nonmarket forces of varying intensity. Therefore, we must attempt to understand the formation and modification of tastes and preferences. Since neoclassical economics confines itself to the analysis of the exchange event, and gives no information on either the formation or alteration of tastes and preferences, this search must be carried out elsewhere for explanations.

If preferences are the expression of tastes then *preferences are a function of tastes* for the market agent. In that case, even if tastes are fixed for the life of the market agent (a brave assumption, considering that world views change with changes in age and experience) preferences would not be expected to remain unchanged over time. Informational inputs would act to refine the expression of underlying tastes and cause preferences to be altered accordingly.

In contrast to the neoclassical paradigm, institutional economics rejects the model of economic man as only a local-cum-global optimizer, who calculates shadow prices with perfect information and makes economic decisions at the margin. The institutional man concept includes activities such as working in groups, doing right as well as wrong, seeing his own utility maximization as integrated with other agents being able to obtain equal or greater satisfaction. Institutional man is also concerned with various aspects of

life such as status, self esteem, the desire to be of service and perpetuate the group with which he identifies (North 1990). These items are not ordinarily modeled in neoclassical economics. Institutional man sees the elements on this expanded list of characteristics as all having economic significance (the winning team, after all, splits the cake and the bill, and gets to write history). Translated into neoclassical language, the model of institutional man does not reject individual utility maximization as being the sole object of economic activity, but it does see such optimization as far more global and inclusive than the rather myopic practice of local optimization usually assumed for neoclassical *homo economicus*. It also shifts the focus from the individual actor to the group, from *homo economicus* as originating all economic actions based solely upon private interests, to individual economic actions being a *function* of the group characteristics with which he is identified².

Much of this material neoclassical economics can enfold within its paradigm, e.g., the debate concerning whether children choose to support their parents, or do parents support their children with bequests, etc. This concerns the resolution of global, intergenerational utility (Blanchard & Fischer 1989). Also, the microeconomic modeling of how the individual actor responds to incentives in making decisions at the margin is

² It can be argued that there is no need to resort to institutional economics to explain the process whereby individuals care about others and are willing to generate wealth streams for their support. Utility functions which require that other agents achieve well-being before their own maximization is possible would suffice. Also, Reder's argument foresees utility maximization in a truly global sense, rather than the more standard local optimization process usually associated with utility maximization.

While such reasoning is adequate, there is no justification in stubbornly depriving our analyses of extra-neoclassical economic constructs if these can broaden the base, and hence the usefulness, of the arguments.

routinely extended to how groups relate in economic space (Just, Hueth & Schmitz 1982; Gandolfo 1987). The "offer curve" in the Edgeworth-Bowley box analysis is just such an extension from individual responses to group responses, as are the ordinary demand and supply curves.

Institutional economics assumes diverse sets of rules and regulations determine outcomes, and sees a social construct where economic operational rules and regulations are received from society. Transaction costs are also critical to institutional analysis.

Institutional economics is concerned with the study of how economic systems are structured, and how that system changes in response to collective action. Institutional economics sees individuals as members of firms, families, and other organizations, while orthodoxy---following the precepts of methodological individualism---regards individuals as autonomous maximizers and as the sufficient unit of economic analysis. . . . (Bromley 1993; p. 837)

All economic activity, therefore, takes place within an institutional regime. Since an exchange event requires the presence of three elements, (a) transferable property rights, (b) rules acceptable to both parties for contracting the exchange, and (c) mutual benefits from the exchange, clearly, the last element is the only one endogenous to the exchange itself. The other two elements are exogenously supplied from social structures outside of the exchange event³. If this is the case, a change in the institutional regime

³ If proof of the necessity of institutions in supplying transferable property rights and rules and regulations governing the particulars of the exchange were needed, consider the outcome when the central government is unable or unwilling to supply these essentials. As reported in *The Economist* (July 8, 1995),

The Mafia in Sicily, argues Mr. Gambetta*, grew up in response to a particular kind of market failure. The state was weak, which meant

influences economic outcomes. If the institution has been operational for a long enough time period (a generation or more), it also influences the formation of tastes, and hence, preferences. If this were not so, how could economic outcomes, particularly the economic viability of emerging market agents, change as a result of the presence or absence of such entities as the family, church, accepted rules of contractual exchange, etc? Being human constructs, all these institutions are therefor human-directed and altered.

Let us investigate one social entity to see why it exists, why it is continually maintained at positive costs to society, and what it is supposed to accomplish for the overall society, or for smaller social units. We start by defining social constructs such as schools, families, religions, as institutional *emanations* which exist to give flesh to the sets of rules and regulations which actually comprise the institution itself. This can be pictured in much the same way as the Christian or Moslem religion has been organized and maintained to give tangible force to the codified teachings (the institution) of Jesus and Mohammed, respectively. These emanations contain more than just the institutional framework, however; by virtue of their complexity and societal involvement they also come to possess a culture, an aesthetic and an intrinsic set of values or professing a

that there was no legitimate body to enforce business contracts and property rights. A farmer, for example, could not be sure, when he bought a plot of land, that the seller actually owned it. The result was an economy permeated by a basic lack of trust.

Mr. Gambetta contends that, where there is no trust, protection becomes a substitute for it, albeit a poor and costly one. ...

* "La mafia siciliana". by Diego Gambetta. Torino. Einaudi. 1994.

specific ideology⁴. Thus, these institutional emanations have been layered over time with input and modification from other types of institutions which exist coincidentally with them.

The institutional emanation of public education is supported by society and has existed in this nation since its birth. Public education's mission statement is the Northwest Ordinance of the Articles of Confederation which formed its institutional underpinnings. In not refuting this statement it was seen that the Constitutional Convention was giving tacit acceptance of this text (Pulliam 1982). Its purpose was initially to create good citizens (NW Ordinance: Pulliam 1982), but has shifted to include the development of tools to make the individual economically viable (Thurow 1993).

Both purposes can be restated as *creating individuals that are both socially and economically viable, that is, individuals who can serve the needs of society and the economy*. Again, according to Reder,

In most societies there is a conflict between what is in the interest of the individual or his immediate family, and his various obligations to God, Caesar, creditors, or their cultural analogs. The official moral doctrine stresses the importance of fulfilling obligations and the punishment that awaits the defaulter. It is within the family and the peer group that one learns the "facts of life" which involve the fine art of how, and how far, to shirk social obligations in the interest of self and immediate kin.

The part of education that consists in impressing his moral duties upon the individual is not small. And if left to the family alone, or its hired agents (teachers), the social interest in teaching the nature and

⁴ The idea of an institution as being a set of relationships and rules eliminates schools and banks from being institutions themselves (Bromley). Rather, they are emanations from institutions in much the same way that the rays of the sun are not the sun itself but that which translates the sun's energy upon the earth.

importance of social obligations would tend to be neglected. Hence the involvement of church, state, or their amalgam, in the process of character formation. To venture a bold conjecture, the concern with character formation is a major reason for the dominant role played by the central authority of society (church, state, or other) in the production of education. In particular, it explains why profit-seeking firms have not been permitted to become major producers of that part of education that is admixed with character formation. (1979: p. 145)

The individual is thus expected to have his character altered as a result of exposure to, or immersion in, this institutional entity; if this were not so, or if this were not generally possible, the maintenance of the institution by society using scarce resources would not have been supported generation after generation. As asserted above, the economic meaning of "character" is tastes and preferences.

The assertion that the purpose of public education is to alter the character of the individual in society, transforming him from a proto-citizen to a true citizen has a serious flaw, if such transformation is expected to radically alter tastes and preferences. As earlier quoted from Reder, most psychologists agree that tastes and the individual's world view are formed in its essentials much earlier than the age of six when school commences for most Americans. Some school-aged children are found to be too immature and too unfocused for the formal environment of school, and need remedial work to be made ready.

This also indicates that some vital socialization and preparation is needed before schooling can commence. Certain investments in the child must be undertaken at the earliest stages of development in order to prepare him or her for the formal learning environment. The entire process of formal learning can be fairly characterized as

forming human capital; as suggested above, the comprehension of the need to sacrifice present wants and work for future rewards is the cornerstone itself. As just mentioned, that cornerstone must be firmly laid even before the child sets foot inside a school room. Thus the formation of human capital is an interdependent dynamic process, as dynamic as the human life in which it is being formed. Investing in this process, laying the cornerstone of human capital formation results in the child becoming a self-investor.

By first principles, wealth can be formed only through the process of investment, i.e., the sacrificing of current period tangibles for future reward streams, however abstract these rewards may seem at present. By extension, investment relies on the presence of capital. This also assumes that gains or losses from one period are compounded through time. Understanding the nature of the investment process and the dynamic character of human capital formation leads to the conclusion that whatever can buttress the development of a sense of future in children will enable society to sustain itself over time, and whatever threatens this development imperils society's future by imperiling the comprehension of the need for investments to be made in life. For this reason, the influence of social institutions in the formation of tastes as they affect the demand for current consumption or for current investment is of vital concern to social scientists.

Preferences may change in response to the iterative application of new information in ever more sophisticated expressions of the underlying tastes⁵. The Stigler-Becker

⁵ For example, when income increases (a demand shifter) a different bundle of consumables would then be purchased. Some goods which had been considered normal and luxury goods in the old bundle are then considered inferior and normal respectively

assertion that tastes are assumed fixed for the life of the market agent does not therefore rule out changes in preferences, and could actually strengthen the argument that what happens to the individual in his earliest years is of vital importance to society, since he or she will be a life-long member of that society, either helping to support it, just breaking even or being supported by it, depending upon his or her underlying taste set⁶.

It would be impossible to clearly isolate all the complementary and countervailing institutional influences affecting the set of tastes possessed by the individual. In all probability, there is a strong feedback characteristic to these influences as they affect actions through time periods. Since institutions are human manifestations, and are carried on by humans, then, as humans are thus changed, they come to alter the character of the institutions themselves. This can either accelerate or dampen preference changes.

An example of altering tastes and preferences and affecting institutional behavior over generations is represented by the change from the conformist times of America in the 1950's to what the United States experienced during the 1970's and beyond. Possibly as a result of the Cold War and the threat from Soviet communism, during this decade, as most memories will testify, it was a received article of faith for good American citizens not to question their government too severely, to abide by the consensus (Hoover 1958, 1962), and to sacrifice for the next generation. The "American Dream" articulated

after the income increased. Have tastes changed? Probably not; what has changed is the power to more fully exercise tastes that have always been there.

⁶ Individual tastes are referred to here. Group tastes cannot logically be restricted, since they would be assumed to change as the makeup of the group changes over time, as group members drop out and others are added.

by president Truman promised every American a home, a job, and a rising standard of living for each subsequent generation. The generation in power in the 1950's had endured the longest and deepest depression of this century during the 1930's, had just survived a World War which laid waste most of the industrial world and claimed millions of lives, and now faced the distinct possibility of mortal combat with the Soviet Union.

The national government was financing the rebirth of an economically devastated Europe and Far East. The G.I. Bill was financing the higher education of an entire generation of Americans returning from military service. The Interstate Highway System, a gigantic infrastructural improvement, was under construction all across America, while national indebtedness was shrinking because of rising incomes and a progressive federal income tax schedule. In economic language, *market agents were maximizing intergenerational global utility*, where their own utility was a function of intertemporal consequences and their rate of impatience was low. Americans of that time also saw themselves as members of a group, as "Americans," the victors in the War, the defenders of the free world against the communist threat of world domination, and the participants of the world's highest standard of living. There was a feeling that we had to stand as one, that serious dissent meant a "breach in the lines." As late as 1962 J. Edgar Hoover wrote

. . . This is not the time for inaction nor is it the time for vigilante action. We must unite as a people. We must understand our basic American heritage under law, and we must face the threat of communism with deliberation, quiet courage, and knowledge. These are the qualities from which communism shrinks---these are the qualities against which communism can never succeed. (p. 187)

This national personality had positive short term and long term consequences for children and youth who came of age in the 1970's. These children were raised under far better socio-economic conditions than their parents, who had been children during the Great Depression and young men and women during World War II⁷.

But the solidarity of the 1950's gave way to the social disruptions of the 1970's. The Viet-Nam War, civil rights struggles, the widespread use of recreational drugs, the loosening of social controls on sexual activity before marriage, all these changes affected the tastes of those who were children in the 1970's and youth in the 1980's.

By 1996, the national personality had radically changed, both in terms of private and public investment decisions, and in terms of what kind of world our children would expect to inherit. In the 1950's our perceived enemies were without the borders; in the 1990's they were within. In the 1950's we spent more on industrial research and development (R&D) than any other nation; by 1993 we had been overtaken in R&D spending as a percentage of GDP by five other nations. When only private R&D is counted, American expenditures as a percentage of GDP was twentieth out of twenty-three nations in 1992 (Thurow 1993). Private and public indebtedness is at historically high levels. In time of peace America has gone from being the world's largest creditor nation to being the largest debtor nation. Among industrialized nations our savings rate is the lowest, our divorce rate is the highest, as is our homicide rate, particularly among youth. The poverty and homeless rates for children are also among the highest in the

⁷ This next generation, called "baby-boomers," had every expectation that their own children would inherit a still better socio-economic world.

industrialized world. Incredibly, as stated above, having children statistically assures that a family will likely be poor; and for the first time in this century, children, not the elderly are now the poorest cohort in American society. It is as though we have gone from maximizing *intertemporal* global utility to maximizing an extremely myopic *intratemporal* utility possibility set, one where our utility is no longer a function of the utility of our children, of other persons, nor of any future set of consequences of present time actions.

This shift in preferences indicates, if we follow the logic just developed, that tastes have changed, and along with them, preferences. If tastes have indeed changed, we cannot seek the explanation from the paradigm of neoclassical economics, because there it is assumed that tastes and preferences are exogenous to the market system and fixed for purposes of analysis. It is not clear that neoclassical economics would reject the hypothesis of changing aggregate tastes over the long run, due to the assumption of no fixed inputs, and by extension, no fixed tastes and preferences, in long run analysis.

Clearly, what is considered responsible behavior at home, at work and as a public citizen has changed considerably. The social environment of the final years of the twentieth century is far different from that of the 1950's. Why? What has caused this difference? Is the government sending out a different message? Are churches and houses of worship altering their strictures? Is the social fabric being woven on a different loom than before? The answer is that social institutions have changed, which change has in turn caused a change in individual tastes for all agents in the economy.

Acknowledging the existence of institutions that form the characters, and hence

the tastes and preferences, of market agents yields a plausible explanation for why tastes change over generations. Between 1950 and 1990 institutional reformations have caused a decrease in the willingness of market agents to invest in the structures and institutions which support the formation of human capital in society, and an increase in the demand for current consumption.

In 1981 President Reagan predicted that high-income Americans would save more if they were taxed less. Their income taxes were cut, but the American taxpayer spent his or her extra after-tax income on a consumption binge. Private savings rates fell to all-time lows in the aftermath of the Reagan tax cuts. (2.9% of disposable income in 1987). . . . Defense spending rose from \$131 billion in 1980 to \$314 billion in 1990. At the same time infrastructure and skill investments declined. The bottom line was a large government deficit used to finance consumption and a decade in which Americans made fewer provisions for their own futures than they had in any decade in their history. (Thurow 1993, p.264-5)

Certainly, other things were at work here than just an intergenerational shift in tastes. In the time just referred to, the 1980s, business taxes were not reduced along with personal taxes, making business investments less attractive than they otherwise would have been. However, if the very idea of investing, or even saving money⁸, is viewed less favorably at present than in decades past, and Americans have become more

⁸ This is a function of available credit to some extent. If, as Keynes argued, the reason money is saved is to lay it aside for future requirements as opposed to using it for investing, then the availability of credit reduces the need for savings. If most goods can be acquired using a bank credit card then the need to have cash in savings is mostly obviated. But the widespread availability, acceptance and use of credit itself represents a fundamental shift in consumer tastes and citizen concepts of thrift and consumerism. This itself is an institutional shift.

willing to tolerate large levels of personal and public debt, then there must have been a fundamental shift in the way market agents conceptualized the marketplace (Bromley 1989), its possibilities (Flavin 1981), the social construct, and their own future within it (Hubbard, Skinner, Zeldes 1994). The results of such a shift would be long lasting since tastes within a generation are still assumed to be fixed. This shift would mean that the promise of the "American Dream" guaranteeing a rising standard of living for each new generation, which was based on the assumption of adequate investments in children and youth, would be in jeopardy.

Complexities in the Intertemporal Demand For Human Capital Formation

This section discusses some of the difficulties associated with providing an economy with adequate supplies of human capital. It introduces the concept of market failure that involves the supply of those factors essential to human capital production and supply.

Assume that suppliers and demanders meet for an exchange, but suppliers worry that their production will not be what demanders want. Since suppliers will have already incurred costs far in excess of the ordinary search costs incurred by demanders, suppliers have a great incentive to supply only what they know will be demanded. Under these circumstances, markets can be considered demand-driven.

The production of human capital is therefore dependent upon there being sufficient demand for it. But the demand for human capital, as for other capital goods, is derived; human capital is not a final good but rather a factor essential for the production of all

final goods. Also, as with any investment process, investments in human capital supply (formation) are not without risk. This in itself is not a drawback; risk is not an impediment to investing as long as investors can earn risk premiums from the investment. The difficulty with investments in human capital production is that the risk premiums are abstract and hard to calculate and assess.

Investments for human capital formation are further disadvantaged because of the very nature of human capital, as discussed above. As the proto-factor for all production, wealth creation and value determination, human capital is a super factor, difficult to quantify and very abstract, so the investing public has difficulty understanding the mechanics and the necessity of such an investment. Consumption demands and more tangible investment proposals are easily represented to the investing public using cash-flow diagrams, internal rate of return analysis, net present value, net future value, etc., making investments which lend themselves to such analytical techniques more attractive to potential investors.

More specifically, in the private decision to support human capital formation, that is, to support the institutions and constructs which form human capital, public benefits are not reflected in private costs. The public benefits from human capital are eventually experienced by all as a positive externality while the private human capital formation costs are not. In addition, while the benefits of human capital eventually become externalized human capital itself is a private good, rival and exclusionary, and private formation costs (college education, apprenticeship programs, etc.) can be a considerable burden for the individual.

This sets up a classic information/externality problem, where many of the gainers do not pay for the costs of human capital production and supply, and are possibly not even cognizant of the benefits they are receiving from the stock of human capital already produced. The external benefits are thus intertemporally nonexclusionary. The agents currently benefiting from an earlier formation of human capital did not put up the investment capital or take the risks involved with the good's development or production. The invention of the transistor provides benefits to the present generation of users, even though it was the generation of 1947 which actually put up the investment capital⁹. In this limited sense, previously formed human capital is intertemporally nonexclusionary. This would seem to make human capital a quasi public good, and the investments required for its formation candidates for social policy intervention. A public good is defined as ". . . a good (or service) that has two characteristics, . . . nonrival consumption and nonexclusion" (Browning & Browning 1987). While often confused with externalities, public goods are distinct.

At a formal level, externalities and public goods are very similar. If a person is inoculated for a contagious disease, there are nonrival benefits; both that person and others benefit from the inoculation. In addition, it would be very difficult to exclude other people from benefiting from this person's inoculation. The same is true of pollution, but in this case there are nonrival costs. . . . If there is any difference between externalities

⁹ While the individual applications of human capital might be rival and exclusionary (one's use of a specific magnetic resonance imager (MRI) necessarily means that others cannot, at that instant, be using it) the many discoveries made from its use have experienced broad, general, and nonexclusionary application. The same reasoning holds for research and development generally; there is a ripple effect connected with each new discovery that benefits all lives without exclusion.

and public goods, it may be the fact that external effects are the unintended side effects of activities undertaken for other purposes. (p. 35-6)

The private decision to form one's own human capital is primarily to earn higher rents from their labor services; additional private benefits might include better working conditions, etc. The difference between externalities and public goods also relates to the manner in which their respective market failures are addressed with intervention.

The existence of public goods creates problems for a price system. Once a public good is produced, a number of people will automatically benefit, regardless of whether or not they pay for it (because they cannot be excluded), so it is difficult for private producers to provide the good. Unless producers can collect money for supplying the good, they will be unable to cover their costs. (p. 25-6)

The standard first-best example of a public good is national defense; it is both nonrival and nonexclusionary. But human capital qualifies in an intertemporal sense. The argument is limited, however, because human capital is not a finished good but a capital good, an input of the production of other goods and services, including of the next generation to be produced. National defense is consumed in the current period as the service of national insurance against border incursions; but human capital is not directly consumed. The tangible support of human capital formation is more a problem of externalities than of public goods. It is therefore termed here a quasi public good.

As discussed above, the investment stream needed for the continual formation and maintenance of human capital is neither insignificant, nor representable by ordinary

internal rate of return, or similar methods of investment analysis. Indeed, the greater and more dispersed the benefits from human capital the harder it might become for market agents to comprehend the need to support human capital formation and maintenance. There are two reasons for this. The first reason has already been explained; it is the nonexclusionary nature of the benefits which make agents unwilling to pay for what they think is a costless good. The second reason is what is called the *stock effect*. When a good takes a long time to be produced, and an equally long time to be drawn down with use and depletion, it is possible that market agents will underestimate current production requirements, since current supplies seem adequate. This could be seen as an example of dynamically myopic optimization, where current period optimization in consumption (benefiting from past human capital formation investments) prevents the realization that there must be offsetting current investment in the good's production for the benefit of future generations. The present wealth holders fail to see the need to dedicate wealth for the formation of future human capital, so that future generations and those working today who eventually retire will be economically secure.

All these difficulties which negatively affect the demand process, the demand schedule relating price per unit to quantity supplied. How does being a super-factor, a factor so omniscient that it is overlooked as needing to be produced, create additional difficulties in its demand? Excluding externality/public goods/stock effect problems, in order to demand a good, service, or factor, its benefits must be well understood. This is an information problem that affects the number of demanders wanting the good. If the

benefits are not appreciated or understood, preferences would also be affected. These effects are in addition to the ordinarily encountered phenomena of changes in money income, in the prices of other goods, and in expectations which usually round out the list of demand shifters. The result of the presence of this information difficulty is to shift the demand schedule for human capital to the left. This effect is in addition to the other difficulties discussed above.

The intergenerational dynamics of human capital formation add yet another layer of complexity to this investment decision, well represented by the stock effect characteristic. Assume that members of each generation only care about their own welfare and not for the welfare of any other generation, either younger or older. To the extent that each generation also assumes that the responsibility for their own support, whether while working or retired, is only their own responsibility, that generation will be less inclined to invest in the human capital formation of the emerging generation, i.e., in that cohort not yet self-supporting. Such an outcome is a manifestation of one generation's utility being in all ways divorced from that of any other, and results in utility being maximized dynamically locally but not globally because intertemporal utility is absent.

But what if one generation becomes convinced that their own utility maximization, their own continued welfare, depends upon the next generation's economic success? In that case any generation has a strong incentive to support the next emerging generation, if only to assure that they themselves maintain continued economic well-being. This is a globally maximizing system because intertemporal effects are accounted for. For this

to occur the information regarding a generation's own best interests must be complete, and include information on intergenerational economic symbiosis. Institutions play an obvious role in providing this information and establishing the mores of its use and expression.

Again, what if the utility maximization of the current generation in control becomes a *function* of the utility maximization of other generations beyond their own? In that case there would be a strong incentive for one generation to look after the economic welfare, and hence the utility maximization, of other generations, the young and working generation for the old and retired one, the working and the retired generations for the young and still dependent one. This is still local maximization, but since it is dependent for its optimality upon the optimality of the utility of others being achieved, it is sensitive to intertemporal economic outcomes, and therefor is more characteristic of a global optimization. For such a global utility function to characterize generations of market agents, however, individual and aggregate tastes (as distinct from preferences) must be consistent with this position. Institutions and social institutional entities, by forming tastes, also form the nature of utility functions. It is the role of institutions to alter utility functions, as argued above. *If at one time these institutions promoted utility functions that were intertemporally and interpersonally linked, as seen by the behavior of the 1950's generation then the behavior of the 1990's generation might be indicating that social institutions have indeed changed.*

Because of its wealth-creating power, intergenerational human capital formation investment is a form of wealth distribution---a transfer of wealth from one generation to

the next (Blanchard & Fischer). Even though there exists the prospect that the wealth set aside for human capital formation, or its fungible replacement, eventually returns to its original holders, there is no ironclad guarantee that it will. Also, the observation that intergenerational utility strengthens human capital formation investment is just another way of saying that as human ties are strengthened the tangible support of persons belonging to different generations, including human capital formation investments, is increased.

Economic Dynamics And Human Capital Production Difficulties

Dynamic analysis explains how firms and individuals can increase profits from the process of compounding gains made in one time period ahead through time. By making product improvements over time, as seen in monopolistic market structures, gains become realized intertemporally. However, this may mean incurring additional costs in the short run in order to maximize long run profits (Bazaraa, Jarvis, Sherali 1990; Intriligator 1971). New technology used in product improvements must come from somewhere; R&D is the main source of new technology, and requires a long term commitment of resources by management. Like all investments good R&D compounds gains over time. The spawned technology causes supply determinants to shift supply to the right, allowing more to be produced using the same resource amounts as before (Thurow 1993). This in turn increases the possibilities for even more technology applications in the future.

R&D is itself dependent on there being adequate supplies of human capital on hand. The formation of human capital has a long lead time, the result of the time it takes to mature human beings. As the results of research in child education and psychology have shown, and as alluded to by Reder above, the most critical inputs for successful human development must be in place while the individual is still very young. If in the early stages of growth a critical factor is missing, is of the wrong intensity, or its application is mistimed, the growth path from proto-agent (child) to mature market agent (adult) might be suboptimal. If intervention is required or anticipated in order to correct perceived growth difficulties it must be forceful and commence in the earliest years of the individual. This is modeled in economics as the Turnpike Theorem (Blanchard & Fischer) which states that to achieve a certain growth target it is essential to reach the proper growth trajectory as soon as possible and not depart from it.

With individuals having varying capacities for knowledge and skills formation, they benefit from inputs differently, even when such inputs are correctly timed and are of the correct intensity. In light of all these complexities, there would seem to be no hope of convincing any rational investor to fund the establishment and maintenance of public institutional emanations supporting the formation of human capital, the colleges and universities, the primary and grade schools, the laboratories, libraries and learning tools, *were it not for the private benefits obtained from utilizing such factors for self improvement*. But private investments are predicted to be insufficient to maintain such structures because of their public good and positive externality character, as argued above. A public or collective analysis of the *costs of not investing* in institutions

supporting human capital formation, however, reveal that these are far greater in the long run than the costs of supporting human capital formation. Consequently, we find that such human capital formation factors are usually publicly funded or funded from an associative group, such as the alumnae of a college.

Economic States of Being for Mature Agents

Beyond some point in chronological time in the individual's path to maturity it becomes too late to perform any meaningful internal structural changes that affect such elements as the individual's world outlook and his attitudes toward work, relationships, money, responsibility, etc.; that is, the individual's core set of tastes have become relatively fixed¹⁰. Consider that all market agents upon becoming fully matured and reaching taste fixity are either (a) performing successfully in the economy, i.e., benefiting it and paying off societal investments in themselves (a form of loan repayment), (b) are just breaking even, or (c) are a net drain on the economy, incapable of supporting themselves legitimately in the economy. If they are a net drain on society then they are now costing the economy money, possibly even more money than the amount saved by society's not having invested to the fullest in the development of such

¹⁰ This is the Becker assumption, and it is shared by Reder to the extent that I have argued it here. Further changes in the core set of tastes are still possible, but after a certain age, what is usually required to change them is a personal crisis or some dramatic event to occur, a death of a loved one, time spent in the military in war time, having children, the threat of a mortal illness, etc. If, however, persons alter their behavior as they age, e.g., change their driving habits, become more conservative, listen to different music, etc., then it cannot be maintained that their tastes and preferences have not also changed. This entire dissertation argues that actions are the result of tastes and preferences interacting with the set of incentives the world is offering.

agents. Society must cover the cost for their support and maintenance, and/or their incarceration, should they have been attracted to illegal activities as a result of their low economic status.

There is an additional loss to society, perhaps many fold greater than the costs just mentioned. These take the form of the inventions not invented, the work not done, the wealth not formed, the families not properly raised, by all those ill equipped for the socio-economic life of the Twenty-first Century.

This emphasizes the great need to maximize the number of economically viable individuals functioning in the society. Not only does this reduce the number of economically nonviable members, and thus reduces support costs to society, but only economically viable members can create enough wealth for themselves and the commonwealth. These two groups, economically viable or nonviable, form mutually exclusive sets. For a given population, *increasing the number of economically viable members of society automatically reduces the number of nonviable members.*

Thus, like a firm which is blocked from reducing its labor force, and in fact experiences labor force growth each year (the result of the natural increase in population growth), society's only choice is to grow economically, assure the economic viability of each new member of the workforce, so that the commonwealth of state might prosper over time.

If we characterize human, social and economic development as a directed process, as a form of production, is this production system dynamically stable? Clearly not, from the standpoint of requiring too many exogenous inputs (the human capital formation

investments in institutions which assure the supply of economically viable market agents) and being extremely sensitive to initial conditions (as explained by Reder and reasoned above). At its best, the human capital production process cannot show the kind of efficiency that other nonhuman production processes can. Economies of agglomeration and scale are great, the linkage between production factors and final output are tenuous, and the finished good is not a good at all but another factor, essential for further production processes.

Investments in institutions supporting human capital formation thus suffer the problems of risk, of stock effects and of external effects. The production target, the size and nature of the human capital needed at present for future wealth creation evolves and changes over market periods. All this adds to costs, while the benefits are perceived as an omniscient abstraction and do not directly reward producers. There is no way to quantify marginal benefits and marginal costs. For these reasons the cumulative result for the support of factor investments in human capital formation is quite uncertain.

Policy Implications.

"Having the will to win means having the will to prepare"

- Tom Coughlin,
Coach of the Jacksonville Jaguars

This enquiry has argued that the market for factors needed for the formation of human capital experiences problems with asymmetric information, externalities, stock effects, and risk. As already mentioned, however, deliberate, systematic investments in

human capital formation do not guarantee that human capital will be efficiently formed. The statistical relationship between these investments and human capital formation outcomes is no stronger than a correlation (Mincer 1958; Altonji 1993). Even while it might be generally acknowledged that outlays for human capital formation lead to an intergenerational rise in the standard of living, *ceteris paribus*, when the weakness of the linkage between outlays and results is understood by the investing public this additional risk problem can only further exacerbate the problems of the free rider, imperfect information, and the stock effect (Levhari & Weiss 1974).

Some institution, transcending the interests of the market players themselves, could be used to alter overall system performance in specific ways. Government represents the needs of the entire nation, and supplies both the transferable property rights and the system of jurisprudence which assures the very existence of markets.

Governmental intervention in the form of direct wealth transfers has been closely scrutinized and characterized as a failure (Murray 1984). But government intervention can take a facilitative form in the market to reduce transaction costs and redress market failures. The government could subsidize market supply schedules that provide external benefits, or establish property rights for external benefits and augment the privately established offer price for the supplier. It could also play the role of information supplier so intertemporal utility could be properly maximized. This is already done in the agricultural sector by the Economic Research Service of the United States Department of Agriculture, with its numerous crop, cattle-on-feed, planting commitments, and farm debt reports, as well as its outlook and situation reports covering various agricultural

markets. The government could also assume some of the market risk of human capital formation investments, thus promoting these investments by relieving the individual of risk burdens.

Taking human capital formation factor supply decisions beyond the realm of a private investment decision to include their externality characteristics is a market intervention already undertaken by other nations, e.g., Germany and Japan. Both Germany and Japan have comprehensive primary and secondary educational and training systems which, if statistics are to be believed, are more advanced and comprehensive than those of the United States. This allows the highest possible percentage of their citizens to become economically viable. Their rationale for such large scale national intervention and vast expenditure of public funds toward creating and maintaining the factors required for human capital formation is that *the very presence of a citizen will drain, maintain unchanged, or support national economic wealth*. Therefore, it is in the immediate and long term interest of the state to reduce wealth drainers and increase wealth augmenters by maximizing the number of economically viable citizens.

The state of Massachusetts was first among industrial economies to set minimums on the school day and school year for its public schools: five hours per day and 180 days per year. At the time, this was the longest school day and year in the industrialized world (Pulliam 1982). This standard was eventually adopted by the other states in the Union. While specific causality will be debated, it is difficult to argue with the position that this contributed to America's achieving great economic gains and establishing a thriving middle class. Our workers had higher educational attainments and technical

training compared with those of other industrial nations (Thurow 1993). In 1996, however, the typical American school day and school year has changed little since the Massachusetts standard was adopted, and is among the *shortest* school days and school years in the industrialized world, as table 2.0 shows (United States Department of Education, Digest of Education Statistics: 1993).

Table 2.0: Characteristics of educational systems participating in the
International Assessment of Educational Progress: 1991

Country	Average days in school year
Canada	188
Israel	215
Korea	222
Taiwan	222
United States	178
=====	

In addition, comprehensive apprenticeship programs are maintained in Germany for those not college-bound (Thurow 1993). The stark conclusion is that America must find the will to restore its preeminence in education and training for the formation of an economically viable citizenry, or witness an inexorable erosion in its standard of living vis-a-vis its international competitors.

With the current international mobility of financial and nonhuman capital forms, producers will be attracted to those global regions guaranteeing a steady supply of competent, technologically sophisticated workers. In such a world of nonhuman factor mobility, the most important national resource is clearly its national human capital. The

only substitute to growing one's own human capital is to import it from other nations; this we have been willing to do, and has probably resulted in the standard of living in America not eroding as fast as it otherwise would have. But Is this ultimately a sustainable policy approach? If the increasing demands by American nationals to close the gates to the foreign born are answered by firm action America will experience a reduction in its standard of living unless human capital formation is increasingly supported by and for American nationals.

CHAPTER 3

HUMAN CAPITAL FACTOR SUPPLY: AN OPTIMAL CONTROL MODEL OF AGGREGATE ECONOMIC GROWTH

Introduction

The purpose of this chapter is to mathematically model changes in tastes and preferences affecting the willingness of individuals and the public at large to invest in the development of the next generation, from being dependent children into fully independent, economically successful adults. The need for such a model is suggested by the following data which gives a picture of the changing welfare situation of American children.

Following the presentation of some data on child welfare conditions is a detailed analysis of aggregate economic progress requirements through time, from the standpoint of individual human capital formation requirements. Theoretical models from the literature will be presented and analyzed in the Theoretical Development and the Literature Search sections below. After which the model for this research will be presented and discussed. Sensitivity analysis will be performed that will attempt to reveal the strengths and weaknesses of the model. Finally, a Summary will discuss results, their importance, and indicate where research might fruitfully continue along the path represented by this study.

According to many sources, our children and youth are facing a crisis affecting their capacity to reach economic and social viability. For the first time since such data have been kept, the elderly are no longer the poorest cohort of the U.S. population; our children are (Ozawa 1993). In fact, a family is more likely to be poor if children are present (Segal 1991). The threat to children and youth is made remarkably clear by focusing on the following measurements of their welfare.

While there is some question that poverty as defined by the lack of money income is itself a threat to the development of children¹, Lugaila (1992, p. 48) states that young children are most likely to live in poverty. "Twenty-five percent of children under age 3 lived in poverty, and 22.1 percent aged 3 to 5 years lived in poverty, compared to 17.3 percent for adolescents age 12 to 17."

According to Ozawa (1993: p. 518),

In 1990, 20.6% of all children in the United States were poor, compared with 15.1% in 1970. Children were the poorest demographic group in 1990. In contrast, only 12.2% of the elderly were poor in 1990. These figures indicate a great transformation in child poverty---until 1973, the poverty rate of children was always lower than that of the elderly .

Segal (1991: p. 455, Table 3), cited data which show that child poverty decreased during the 1970's, falling to 17.1% in 1975 from a high of 26.9% in 1960, only to increase again to 19.6% in 1989.

Children of young parents and those living in female-headed households are at greater risk of living in poverty, but *the poverty rate of any*

¹ See the results of the next chapter.

household with children is three times greater than for households without children, (italics mine). (Segal 1991: p. 456)

Related to the poverty rate among American children is the increase in homeless children. Maston et al. (1993, p. 335), evaluate various measures of child well-being for children living with homeless families. They state that

In the past decade, there has been an alarming increase in the number of homeless families with children and, concomitantly, a growing concern about the welfare of children living under such precarious and marginal conditions (Institute of Medicine 1988). In a status report from the U.S. Conference of Mayors (1989), it was estimated that 36% of all the nation's homeless were families, and well over half of those family members were children. Nationwide, it has been estimated that 100,000 children may be homeless with their parents on any given night.

In a review of statistics concerning the social well-being of homeless children Molnar and Rath (p. 110: p. 114) reviewed various studies in order to bring together the various findings in this area. Under the heading "General Development," the authors draw our attention to how the homeless environment could impact on the character development of children. They state:

Largely relegated to substandard, overcrowded living conditions, exposed daily to filth, violence, and random destruction, and bereft of age-appropriate activities, homeless children exhibit developmental difficulties far greater than the population at large---greater even when compared to poor but housed children . . . Sleep problems, shyness, and aggression were reported more frequently by mothers of homeless children than by mothers of the emotionally disturbed norming [sic] sample. Those problem behaviors, along with attention deficits, speech delays, withdrawal, dependency, poor coordination, and toilet-training problems, were more frequently mentioned for the homeless children than for the children in the nonclinical sample . . .

Parent-child interaction was also noted to suffer for homeless children. The stressful conditions created "emotional ambivalence" of some homeless preschoolers toward their mothers (Molnar and Rath p. 115).

School attendance for homeless children was noted by the authors to range in estimates from a low of 43.7% to a high of 70.0%. However, the older the child, the less likely that s/he would attend school (Molnar and Rath: p. 116). Other measures of educational performance, such as difficulty in grade retention, poor academic performance, and the need for special education were found to be uniformly greater for homeless children than for children living in homes.

Violence toward children by care givers is a disturbing reality for many children. Possibly more disturbing is that this tendency seems to be increasing for children at earlier ages. In a recent study Wolfner & Gelles (1993: pp. 209-10) state that in 1975 male teens were the most likely target; but by 1985, male preschoolers were the most likely targets of abusive violence.

Youth gangs are increasing in power and influence, sometimes competing with parents or guardians for their children's allegiance and sometimes replacing the parental role entirely. Hunzeker (p. 29) quotes Ronald Huff, director of the Criminal Justice and Research Center of The Ohio State University, as stating that

. . . where neighborhoods, schools and families have decayed or dispersed, youths look for other means of esteem-building and social identity. Gang association and crime become attractive options where legitimate economic opportunities are lacking and social order is weak. Typical gang activities mirror the need for economic and social identity.

The presence of gangs in the environment of youth clearly erode the quality of life for children and youth. Where gangs become a force within schools, they can be expected to be just as corrosive on the educational experience of children and teens.

The economic significance of these phenomena for the future of the American economy is in the linkage between their presence and the extent to which children's ability to assume productive roles in society upon reaching maturity is impaired. If the impact upon a suitably large number of youth is significant, perhaps too few youths will be capable of maturing into productive members of society, diminishing the wealth of society directly and increasing the wealth creation burden on the rest of its members. Not only will these youths fail to enrich society, but they themselves would become in some way dependents on existing wealth stores, diminishing aggregate economic growth and stability inexorably over time.

Theoretical Development

Human Capital Investment Incentives

Assume that the child cohort is the primary factor for the production of human capital, to which must be added many additional scarce factors, each in the proper amount and properly timed. After sufficient time has elapsed, an acceptable percentage of the child cohort has become human capital, capable of carrying on the process of maintaining human society over time. Absent those additional scarce factors, or absent their proper application to the primary factor of human capital, the percentage of economically viable human capital forthcoming from the child cohort is not maximized.

The data presented in the previous section would suggest that large numbers of children today are indeed not receiving the kind of support they require to become economically successful adults. This in turn would affect America's economic growth path, causing lower levels of essential capital to result at any time, which would thus reduce the consumption opportunities for future generations.

Human capital is a capital good, i.e., is not itself consumed, but is essential for the production of all other consumption goods. How might this characteristic lead to human capital formation investments being under supported, and how would aggregate economic growth be affected? Clearly, there are private incentives to invest in one's self, since this leads to higher income streams over the life cycle, and it is assumed that individual utility maximization is the object of all economic activity. This has been both theoretically modeled (Becker 1975) and empirically tested (Mincer 1958). Growth models have shown that if market agents believe that they alone are responsible for their maintenance after they stop working, they will have a strong incentive to over-save, since their time of death is uncertain and they would not risk running out of funds while still alive (Blanchard & Fischer 1989). But the purpose of these funds would be to purchase needed goods and services supplied by the next generation. If that generation has not received adequate levels of growth factors for the formation of their own human capital, there might be no way to supply those goods and services that retirees might demand. This realization logically encourages one generation to invest in the human capital formation of the next, to invest some share of currently held wealth for the creation of

the next cohort of viable market agents, assuming that agents are perfectly cognizant of this situation.

While such actions are logical, it is difficult for some agents to properly appreciate the need to carry on such actions continuously, without lapse, no matter how rosy the current economic situation appears. The planning horizon for capital formation investment transactions is long, and the relationship between making intergenerational investments and receiving benefits therefrom is not deterministic. But what if, even while not comprehending the advantage to themselves of investing in the capital formation of the young, their own utility was a function of the utility of their offspring?

In that case, individual utility maximization would also yield a situation where the next generation would receive the necessary inputs for their maturation into successful market agents with wealth and investment bequests from the older generation having offspring. That is, the social optimal investment level would be the same as the private optimal investment level. The social planning horizon would thus be infinite, with present circumstances being perfectly represented by future circumstances properly discounted. Uncertainty would be eliminated since future generations would act precisely as the present one does; Ricardian equivalence would be generalized.

The problem is that a significant percentage of the present generation have no offspring, or if they have, do not take responsibility for them. For those agents this utility linkage won't work. So the aggregate supply of sufficient investments in human capital formation can not be assured from private utility maximization processes alone, because of the free rider problem.

Aside from this, if the present generation believes (perhaps incorrectly) that there already exist sufficient stocks for human capital formation, then they might have a tendency to dedicate more income to current consumption and less to human capital formation investments, i.e., a stock effect would be seen. How could this be so?

The current generation benefits from its own human capital and the human capital already formed in the last generation. It may not see the immediate need to reduce current consumption so that human capital may be formed for future needs. It seems that, in an age of the nuclear family, or the single parent family, or where three generations living under one roof is a rarity, each subsequent generation must rediscover the ongoing necessity to put aside some of its wealth for future generational needs.

This argument gains strength when combined with the notion that external benefit streams exist for human capital. In that case, the free rider problem, experienced under conditions of external benefits or public goods, might be exacerbated by the stock effect. This is due to the nonexclusion in consumption exhibited by human capital over time. As a capital good, human capital is used to produce all other capital and finished goods; it is impossible to exclude its use in production processes that benefit only some users but not others. Whether having helped to pay for the human capital stock or not, all benefit from its use. Stock effects enlarge the external benefit problem and make it more difficult for market agents to see the need to maintain a steady stream of investment capital for the formation of the human capital within each new cohort.

Human Capital Formation: The Production of Market Agents

The formation of economically rational individuals can be modeled as a production process, where the child cohort is the primary factor, and secondary factor arguments are essential for the success of the production process. These produced market agents are in turn supplied to the economy. They then act in the economy as capital goods, and in so doing, optimize their own utility. Their utility maximization level will be some function of their own level of human capital, both endowed and created through prudent investments, and the economic opportunities extant in the economy.

In microeconomic textbooks the topic of production functions and their related factor requirements are dealt with under cost functions (Varian 1992), market equilibrium (Henderson & Quandt) or as production functions under the general heading of the theory of the firm (Intriligator 1971). In the last case, the firm's theoretical production function is assumed to abide by two axioms: increased input will not decrease output (nonnegativity of all first order partial derivatives of the production function, i.e., their marginal products); and as more and more of an input is added for a given fixed input, the increase in output diminishes inexorably as the variable input's marginal product falls (law of diminishing returns) (Intriligator 1971: pp. 179-81). Further qualities are associated with such a production function, such as returns to scale, substitution possibilities, etc. (Intriligator 1971: pp. 181-3).

In terms of human capital production, various necessary "factor arguments," such as security, nutrition, discipline, education, emotional support, spiritual development,

intellectual stimulation, etc., etc., must be provided to the production function of the maturing individual in a timely manner to promote socially acceptable and economically rational individual behavior. The *time to completion* in the production of the

economically rational individual is not treated in economic literature; there is no minimum or maximum age or chronological time span for the formation of the economically rational person. However, if society is to avoid the costly pitfall of squandering all its resources in a vain attempt to achieve a state of economic rationality for every one of its citizens, benchmarking will be needed. Success could then be claimed if a percentage of its citizens attaining economic maturity were sufficient to maintain and grow the economy from one generation to the next.

This is an application of the law of diminishing returns: the fixed input is the natural talent of the individual; the variable inputs are the many factors needed to economically mature the individual. For this study the age of economic maturity will be defined as reaching the stage of economic rationality².

Rationality Defined

"Rational" preferences are well defined in the economic literature (Varian 1992: pp. 94-7; Binger and Hoffman 1988: pp. 106-13). Rational preferences are complete, reflexive, transitive, continuous, exhibit nonsatiation, exhibit diminishing rates of

² Of course, this age varies from state to state and from whether the context is federal laws or state or local laws. It is not a point of contention here; any recognized age selected from this standard will suffice. The point is to allow the age of economic maturity and legal responsibility to be the same, so time is not wasted in searching for the ideal age for economic rationality to occur.

marginal substitution, and form bounded, convex sets. These axioms can be thought of as an economic expression of consumer preference rationality. They define what actions in the realm of consumption behavior are allowable, in a sense, economically "legal", within the paradigm. But they are applied mostly to static analysis. Dynamic analysis imposes additional constraints on rationality, e.g., that the mature market agent possess a personal planning horizon of sufficient length to include the possibility of learning from past events, and being cognizant of the relationship between current actions and future possibilities, i.e., to be capable of experiencing regret and anticipation. Additionally, it would be useful for the agent to have some degree of intertemporal patience, so that, where promising investment opportunities present themselves, individuals would have the necessary discipline to see them carried out to fruition. Some of the important differences between static and dynamic analysis are dealt with below. *Rationality for this study will include the ability to maximize utility across time.* This feature gives the agent the necessary understanding to engage in investments and is the dynamic analogue of constrained utility maximization in static analysis. Although this is probably assumed for most economic models it is explicitly introduced here.

Tastes

Tastes are assumed to be exogenously supplied in neoclassical economics and are not treated within the paradigm except as a source of unalterable data (Stigler and Becker 1977). Preferences could be considered a tangible expression of those tastes. Although certain elements of early childhood have been identified as influential on the formation

of tastes, such as family characteristics, economic status and social capital (Beaulieu 1995), there is little agreement concerning how these and other elements are actually incorporated in the maturation process of the individual. Common experience would indicate that tastes are formed at a very young age in the individual. This study treats tastes and preferences as having distinct roles to play in the market agent. According to Reder (1979), in his essay on the positive role of morality in economic society,

If a community were collectively rational it would try to raise its moral tone. To effect this, it would be necessary to *produce* transactors who were more moral. (Use of punishments and rewards is no substitute; they affect behavior *given* preference functions. The problem is to alter the preference functions themselves.) To understate the matter, the technique of producing better and worse "character" in individuals is not well understood. However, there is strong consensus which I think would be widely shared in all societies, that character is somehow produced in childhood and youth; i.e., in the "formative years." . . . (p. 144-5)

Static and Dynamic Comparative Analyses

Of central importance to this research is the difference between comparative statics optimization and comparative dynamics optimization. In comparative statics the object is utility maximization in a static world. Tastes and preferences for individuals are assumed fixed. Prices are often given (exogenous) and price is the same as marginal benefits for the agent lacking any market power. The key to winning in the marketplace under these circumstances is to obtain as much as possible within given budget and cost constraints. At the firm level the object is to maximize revenues minus costs, given a set of costs for inputs, a firm size, a technology set and a price for the finished product.

Profit maximization is the only allowable goal. The only decisions resting with the firm are how to cut costs or whether to go out of business. Even where some market power can be exploited by differentiated products competitors, it is often transitory, leading to quasi-rents as many such goods and services have close substitutes.

Under conditions of comparative dynamics, however, the analysis changes. Time becomes an argument; this means that dynamic analysis does not just sum a number of independent static periods, but integrates market periods and treats them as being interdependent, with outcomes in one period affecting outcomes in another, later period. This analytical context makes intuitive and logical sense for the study of the formation of human capital. If the reader had not received adequate levels of nutrients as an infant, or if her guardians had not seen to her education in a systematic and conscientious manner, it is doubtful that she would be able to read this paper now.

Dynamically, tastes and preferences cannot be assumed to remain unchanged. Individual preferences will be altered in an ongoing process of expressing the fixed core set of tastes in the process of learning from experience. Group preferences and tastes will also be altered through time as the complexion of the group changes as its members fall out and are replaced by others having different tastes than those they replaced.

Optimization is very much a global process under dynamic assumptions. The key to winning for the individual or the firm is not just in optimizing the outcome of any particular market period, but in choosing the most economically profitable growth path to optimize all possible market periods. This is a far more complex decision problem than what normally exists in static problems. Under dynamic circumstances, while the

firm's goal remains profit maximization, it might best be achieved by suboptimal profit behavior in the short run, through rapid market share growth, or shifting the production possibilities frontier outward as rapidly as possible (Thurow 1993: p. 150). For the individual agent, the attempt is to force the budget constraint out from the origin as far as possible, to increase income over time, so that the spending stream will be as large as possible over the entire life cycle.

Blanchard and Fischer (1989: p. 101) explain what is needed to optimize economic outcomes over time: it is to grow the capital stock from which consumption flows are expected to be forthcoming, sufficient for all current and future needs. "The best way to go from any k_0 to a specified terminal capital stock k_{T+1} , if T is large, is to stay close to k^* [the optimal size of capital at any time] for a long time." This means that for an aggregate growth plan to be successful over time *it is necessary to get on the best growth path early and not allow the economy to drift off that path*. It also requires a high level of reinvestment of profits, public and private. If this does not occur, the desired goal will never be reached.

Comparative dynamics optimization places greater importance on deliberate and significant reinvestment by agent interests and places less importance on cutting current-period costs or optimizing current period spending possibilities. Because of this, short-term cost cutting programs might actually harm an agent's ability to grow economically as fast as possible and meet the dynamic economic goal it has set for itself. Many examples of this can be found in operations research texts dealing with interrelated multi-

stage optimization problems, such as those found in Hillier and Lieberman (1980), Bazaraa, et al. (1990) and Lawler et al. (1985).

For a generation of agents as represented by a national economy with a given set of demographic characteristics, where the population has some positive exponential growth rate, what must the national economy accomplish in order to assure their citizens optimal economic possibilities over time? Essentially, it must achieve positive levels of capital stock growth which not only keep up with the increase in the growth rate of the population, but cover depreciation on capital, and allow consumption levels consistent with the mean subjective rate of agent impatience, or subjective discount rate, of the population. This would allow citizens to increase their economic possibilities to the extent that the rate of growth in capital stocks is faster than the rate of growth in the population by increasing the capital to labor ratio over time. This adds to economic efficiency and output per individual. Thurow (1993) stresses that in the last one hundred years only one national economy has reached the plateau of the super rich, based on internal and external purchasing power: Japan (p. 204). Essential to this achievement was maintaining a population growth rate lower than the capital formation rate.

With capital growth essential for the continued survival of the economy, the investment function becomes essential for growth, where adjustments are allowed for compounding, discounting and depreciation through time. For this, there is scope for the presence of intertemporal patience in decision making, and the presence of a planning horizon which encompasses all stages or time periods of an economic plan.

Assume that the only basis for an individual to consider a line of behavior is that it maximizes utility over time. Assume further that the *degree of intertemporal impatience* in consumption is a function of agent "maturity," so that the greater the maturity, the easier it becomes to forego current consumption demands for the promise of greater consumption possibilities in the future via investment, i.e., to delay gratification. The expansion in future consumption from the investment is determined by their multiperiod discounted payoffs.

When the subjective planning horizon has reached a degree sufficient to enable persons to appreciate the intertemporal value of all benefits and costs resulting from private investments vs. immediate gratification from consumption, and can operationalize this appreciation in an economically rational manner, let us say that economic maturity has been reached³.

Neoclassical Assumptions on Tastes

The neoclassical paradigm has assumed the exogenous formation of tastes and preferences---and by inference, value, believing that these are formed within the nexus between the individual and institutions. Bromley (1993) states that

³ This is the dynamic analogue of the assumption in static economics for perfect competition, that agents have perfect knowledge of all prices and costs. The dynamic assumption made here, that agents have a planning horizon sufficient to encompass the global optimum condition is just the assumption that agents learn from past behavior.

The further dynamic assumption made here for agents, that they have a rate of patience sufficient to operationalize their learning in a rationally expectative manner.

As Commons argued, institutions define what "individuals *must* or *must not* do (compulsion or duty), what they may do without interference from other individuals (permission or liberty), what they *can* do with the aid of collective power (capacity or right), and what they *cannot* expect the collective power to do in their behalf (incapacity or exposure)".

. . . Institutional economics sees individuals as members of firms, families, and other organizations . . . Adherents of orthodoxy often need reminding that "the market" was not handed down to us from heaven but is, instead, the conscious creation of humans through collective action in the legislature and the courts. (1993; p. 837)

This definition of institutions leads to the conclusion that the stronger institutions are, the greater their power to form and modify tastes and preferences within the individual, *cit. par.* This position has all but eliminates any role that markets themselves could play in modifying preferences. Institutions influence what is considered acceptable behavior within and without the market. Clothing tastes are influenced by such things as acceptability; so is sexual behavior, the use of credit, the style of consumption, the emphasis on investment or savings over current consumption, etc.

If institutions that promote personal investment and consumption restraint become weakened over time, and must compete with, or are replaced by, institutions which promote conspicuous consumption and eschew investment and personal temperance, will not agents within the influence of such changes also reflect this same tendency in their personally formed tastes and preferences, and tend to change the characteristics of their involvement in the marketplace? Or, if the institutions which promote self sacrifice and temperance simply die out over time, and are replaced, not by similar institutions but simply by that part of our nature that is acquisitive, myopic, and in favor of instant

gratification, could not this lead to a change in the aggregate tastes and preferences of generations of persons so conditioned? If so, what might be the economic significance of such changes?

As an example of how institutions affect and form tastes and preferences, consider the money spent by producers and marketers to increase sales of their goods and services. Obviously, if advertizing did not effectively change consumer preferences businesses would not continue to spend money year after year on the advertizing of their products and services, and the advertising sector would diminish in size over time, *cit. par.*

Human Capital: The Economically Rational Individual as Producer and Consumer of Wealth

Like all capital, human capital itself depends on an investment flow to have been established prior to the time when the capital will be needed. For human capital formation, this means that the present generation must be willing to dedicate a portion of its wealth stocks for the exclusive use of the formation of the human capital of the next generation, and so on. All material capital stocks depend inevitably on human capital stocks in the form of better expertise, education, research and development, etc., to be extent. Without such human capital formation no material stocks will appear as there will be no one to invent, apply and perfect them.

It has been argued that if rational economic beings are to be produced, certain factor input requirements must be met, that are, from the standpoint of timing and amount, irreducible in creating the characteristic of rationality. These needs may,

however, be met in a variety of ways, varying in their effectiveness in optimally fulfilling this objective. Since Becker's seminal article on criminality (1968) it has been accepted that economically rational persons, having self-awareness and the ability to judge outcomes through time, will take actions to assure that their consumption needs will be met, by whatever means necessary, via a benefit-cost decision process. This study acknowledges the centrality of that postulate.

Let there be three, mutually exclusive, possible outcomes for individual wealth creation and consumption⁴: (1) Individuals create enough wealth for their needs, the support of their dependents, and for additions to the social wealth. (2) They can support their own exclusive needs but no one else's, nor can they leave anything to societal wealth stores directly. (3) They are themselves dependent upon the wealth of others for their needs. In the first case their presence is a net benefit to society; in the second, at least they are not a cost to society.

In the third case, their presence in society amounts to economic dependence and is a net drain on the economy over time. By consuming the wealth of others, their consumption requirements must be funded by other individuals who themselves create

⁴ The possibility of an endowment is assumed. It can have two possible forms: it can be in the form of natural ability, intelligence, environment, opportunity, etc. This form is factor endowment. The other possibility is the receipt of a wealth endowment already produced by others and inherited by the individual. In this case, the endowment is ready to be exchanged in the market for consumption bundles which maximize utility.

The importance between the two forms of endowment is that factor endowment must yet be invested and further developed. It is like the difference between an intermediate good and a finished good.

wealth over time. This adds to those producers' wealth-creation burden and that of society's.

This condition of dependence can take one of two distinct forms: In one form persons are effectively "adopted" by others in the economy, who assume responsibility for them. This process may come about through family ties, where members agree to support the person in question, or official public policy, such as under welfare programs, etc.

The other form of parasitism is where persons become criminals, actively appropriating the wealth of others through criminal pursuits. If passive parasitism is not obtainable, or does not allow for the acceptable subjective minimum consumption level for the individual, then criminality is the only path to economic sustenance.

Economic sectors have been formed whose only reason for being is the management of crime: how to be protected from it, how to minimize its economic impact, how to insure against it, the management and incarceration of felons, etc. The costs to maintain such sectors reduce available resources for other sectors of the economy and reduces the welfare of the society as a whole. This is because such expenses represent pure consumption in the form of insurance; i.e., it creates no new wealth and results in the economy operating interior to its production possibility frontier⁵.

⁵ Obviously, those who earn their livelihood from battling crime, detective agencies, security companies, etc., would lose directly for reductions in criminal activity. Using the compensation principle, a Pareto optimal point could still be reached that would increase the welfare of all without decreasing the welfare of any group, after reductions to this sector.

The loss to society from the reduction in economic wealth from the foregone output of those agents that have become felons is also significant. It represents those persons' wealth opportunity cost to society⁶. This must be added to the direct costs of building and maintaining a system of legal sanctions for law breakers. Considering the size of the criminality problem in this country, and the increasing demand for dedicated resources required to address it, it would appear that the potential savings to society from reductions in criminality are immense.

Prior Research

Since the research combines aggregate growth modeling, human capital formation and a generalization of the rationality of the choice theoretic, a perusal of research in all these areas is necessary.

Aggregate Growth Models, The Subjective Rate of Time Preference and Planning Horizons

Koopmans (1964) may have set the stage for much of the work that was to follow by establishing the axiomatic foundations for intertemporal utility optimization. He sets

⁶ It has been argued that the possible output of individuals that have become felons, especially those that have become repeat offenders and began their criminal career in their childhood, would be insignificant (DiIulio 1996; p.19). This is spurious; the correct comparison is between the output of those whose background, environment, etc. would not normally predispose them to seek criminal behavior as their only legitimate form of utility optimization, compared with agents of equal native ability but lacking such environmental benefits. Where this is the comparison, it is between potentially fully assimilated and functioning market agents and those destined for economic and social oblivion. Here, the loss to society from foregone output is anything but insignificant.

forth what he considers legitimate structures in evaluating "programs" of utility maximization over time. While this is not specifically a dynamic environment construction, it does set down what is needed to make comparisons of utility through time. For a specific planning horizon discussion the setting must be dynamic.

The planning horizon used in growth models is specified as the limits of integration (or summation in discrete time) within which the functional (the function which optimizes the values of the objective function at any point in time) is maximized. It is exogenously specified and has been treated in models as data. Ramsey-type models use an infinite planning horizon, in the assumption of infinite-lived persons. The Diamond-type models assume overlapping generations, but have effective planning horizons which are infinite in the limit, where bequests formally link generations together.

The model of perpetual youth (Blanchard and Fischer 1989) assumes further that individuals have finite lives of two periods. The first period consists of wealth creation, savings and consumption; the second period consists of a retirement period, where the individuals are living off wealth accumulated during their working period. The probability of death is formally incorporated into the model, transforming it from the discrete time of the overlapping generations model into the continuous time form of the infinite horizon models presented earlier. This simplifies the calculations, enabling the relaxation of some of the assumptions of the overlapping generations model. It is a deterministic utility optimization model which chooses how much to consume and to add to existing stock over an infinite planning horizon. In their text, Blanchard & Fischer

(1989) obtain various outcomes under conditions of both command, and decentralized, economies.

The *rate of time preference* is utilized in obtaining a time valued elasticity of substitution for intertemporal consumption. This in turn is used to investigate stability conditions of the steady state optimum; specifically, how rapidly will the system return to equilibrium for local perturbations about the steady state point.

Since the planning horizon is infinite, there is no role for a subjective planning horizon less than infinity to limit the subjective discount rate within the model optimum. Market agents are assumed to know with certainty what the discount rate will be for the entire time path.

The result is a model which maintains the basic structure of the overlapping generations model with the tractability of the infinite horizon model. It reveals that the amount of capital saved by individuals during their working lives may be either more or less than what a social planner would optimally choose, and depends heavily on the subjective rate of time preference. When agents believe that their lives will be short this value is closer to unity and agents save too little; but if a bequest is allowed, even assuming shortened lives, the subjective rate of time preference is reduced, closer to zero, and agents save more. In fact, they may over save to the extent that all would be made better off if agents saved less. This is close to the topic of this study; the question is, do the data on the current welfare of children presented in the Introduction indicate that the present generation are delinking their utility from the utility of their offspring,

and not providing them with the necessary human, social and nonhuman capital for their needs?

In the model, as the probability of death decreases, the planning horizon increases in length, affecting the propensity to invest and the elasticity of utility with respect to intertemporal consumption substitution. As the authors state, "The effect of the exponential probability of the death assumption [added to the exponent of the subjective discount rate] is simply to increase the individual's rate of time preference" (p. 117; from a Cass and Yaari result, as noted by Blanchard and Fischer 1989).

The use of both the subjective rate of time preference and the personal planning horizon, therefore, is well understood and researched. But has there been an appreciation of the situation where persons acting *as though* they had very short planning horizons, because they think that their life will be short, as being different from that where they actually have only a short time to live? Actually, however the planning horizon is used, it is exogenously specified and thus not solved within the model. But there will be a difference in the steady state characteristics of the economy depending on whether persons have short horizons because of their actual physical extinction, or whether they just *believe* that they won't be around long.

In the former case, both their wealth and their consumptive requirements have been eliminated. In the latter case, however, there has just been a private investment miscalculation. Wealth creation was curtailed and might now be insufficient for the agent's remaining consumption requirements through time. If human labor earnings have been allowed to depreciate, the consumption needs might be greater than what the agent

can accommodate. He would then be forced into either active or passive economic parasitism, as previously explained. This shortfall, if multiplied significantly in the aggregate, will affect long run dynamic conditions for the society and its standard of living.

Hamermesh (1984) looked at the effect of increasing the planning horizon on work effort and consumption. He used parents' longevity as a proxy. He found that increasing the planning horizon had a slightly negative effect on consumption and a positive effect on work effort. These findings are similar to those of the model of perpetual youth, in which wealth accumulation depends upon a person's perception of the length of his life. The shorter the perceived lifespan the greater future wealth and effort will be discounted and the closer to unity will be the subjective planning horizon. This creates a consciousness that makes it very difficult to delay gratification for extended periods of time.

Hamermesh's results are a clear affirmation of the principle that if investment by the present generation into maintaining the welfare of the future generation is diminishing, this may lead to the next generation *not being capable of developing an investment consciousness*, because planning horizons have been shortened and time preferences have increased. Inadequate planning horizons and large rates of time preference cause individuals to consume more currently and be less willing to invest. As the growth model of this research will show, in the limit, this situation leads to insufficient capital accumulation for meeting society's future needs, where one cohort is experiencing diminished wealth creation and rising parasitic behavior. But at what point

will this situation become critical? How much is required to reverse this situation? How long will it take to remedy it?

Have these models assumed some minimum autonomous consumption level for individuals? Other than the common specification that consumption be positive over the planning horizon, and that the consumption function be well behaved, the answer is no. It could be argued that this additional specification would make little difference, but the hypothesis of this research is that it has profound significance on the level of the steady state economy through its impact on the levels of economic dependence in the economy.

The Generalized Choice Theoretic Model

Gary Becker (1968, rev. 1974⁷) produced what has come to be regarded as a seminal article on the economics of criminality (Heineke 1978). In it, societal resource allocation is optimized to reduce crime through altering the personal choice to perform a criminal act. Thus, an optimum level of criminal activity is found where the marginal cost of one more crime is equated to the marginal benefit of reducing one more crime, as the saddlepoint solution to the maximum crime reduction for the available resources, used in their most efficient manner.

In the model, increasing the supply of criminal activity increases social costs unambiguously. Being a static model, an increase in the rate of time preference and increased levels of criminal activity is not analyzed. The closest it comes to

⁷ The page number and sections are from Becker's article as found in Essays in the Economics of Crime and Punishment. Becker, Gary S. and W. M. Landes, editors. Columbia University Press, New York, 1974.

characterizing the attitudes of criminals is in concluding that offenders are generally "risk preferrers" (p. 12), since an increase in the probability of conviction reduces the number of offenses more than an increase in the harshness of the punishment upon conviction. If they were risk averse, it is shown, by differentiating the model, that increasing the harshness would reduce offenses as much or more than just increasing the probability of conviction. But the manner whereby future utility streams are discounted is not dealt with specifically.

Related to this is "the well known result" (Becker, 1968, 1974) that the income for those in risky activities is, at the margin, higher for risk averse persons than for risk preferrers. This suggests that, in the case of criminal offenses, crime, in fact, does not pay, but that this is not entirely relevant to the choice set of a large number of criminals, those who supply most of the offenses. Why this condition of seeming irrationality persists is not investigated. It might be, for example, because of the psychic utility gained from assuming levels of risk (danger) which, unfortunately, are associated with those activities yielding high rates of apprehension and conviction for participants.

In summary, the Becker essay recognizes the central role of shadow prices in personal decisions to commit criminal activity. As he states

Some persons become 'criminals,' . . . not because their basic motivation differs from that of other persons, but because their benefits and costs differ. . . . Criminal behavior [thus] becomes part of a much more general theory and does not require ad hoc concepts of differential association, anomie, and the like, nor does it assume perfect knowledge, lightning-fast calculation, or any of the other caricatures of economic theory. (Becker 1974: p. 9)

Heineke (1978), in his presentation of an overview of the economic literature on crime, describes it as being divided into two main groups: (1) the portfolio approach, and (2) the time allocation approach. Both of these, however, share the construction of a choice theoretic, as just described for the Becker article.

The question of how a dynamic specification affects Becker's (1974) results is mentioned by Heineke (1978). He shows that in Becker's essay (1974) the first derivative of the term which, by being signed, had showed that criminals are risk preferrers, cannot, in fact, be signed when the utility function becomes dynamic and assumes a more general form than that allowed by Becker (1968).

Additionally, it assumes a supply of criminal *activity*, not criminals or non-criminals. The analysis begins with assumptions of the existence of rational human beings in the economic sense and proceeds to investigate the first order conditions of various aspects of the economics of crime in society. It also does not use some specified minimum consumption requirement per individual as a boundary for the optimality conditions.

This research will proceed with a very similar analysis. The difference is that it will begin with the question of the propensity to invest, rather than on the propensity to commit criminal acts⁸. This generalizes the analysis of crime beyond what has been

⁸ Becker did not investigate the propensity for agents to commit criminal acts. As just quoted, he framed the entire analysis more generally, and was not concerned with any preexisting agent tendencies, outside those which obtain in the assumption of rationality. Clearly, however, it is not difficult to model such a propensity from first order conditions of the supply of criminal acts function, or "offenses" as Becker termed them, which he did model in his essay.

done before. This is combined with a minimum consumption requirement expressed as a boundary value⁹ in a dynamic context.

In contrast to the time allocation approach just discussed, the portfolio approach (Heineke 1978), assumes the presence of an exogenous income or endowment which each person has at his disposal. The decision is to maximize utility from the returns of the endowment by deciding what portion could be allocated to criminal activity. The present research has characteristics of both approaches, but has more in common with the time allocation approach.

Human Capital Formation

There is much literature on human capital formation. Mincer (1958) has looked at the effects of human capital, such as schooling, on income distribution. In "Investments in Human Capital and Income Distribution" (1958), he developed a model of individuals' investment in their own human capital that showed that human capital acts like physical capital in most respects. Individuals are willing to spend more time in the training phase of the investment if the returns are also increased. The decision can be treated as a portfolio analysis where the rate of return is used to maximize the present value of all future income streams over time.

Becker (1975: pp. 71-80) discusses the categorical returns to human capital and its investment decisions. In the section, "The Incentive to Invest," he noted that

⁹ Yaari (1965) used a minimum consumption level for a lifetime allocation problem with life insurance, but only required that consumption not be negative; here, it is required that it be strictly positive, and above some minimum value.

increasing the subjective planning horizon raises the returns to human capital investment, making it more attractive to the decision maker, *cit. par.*; that the earlier an investment plan is started in a person's life the more returns can be expected (relates to the first item above); that the incentive to invest is positively related to the number of periods contained in the analysis, the expected increase in per period earnings, and the increase in knowledge of potential opportunities. He noted that an investment plan is negatively related to the increasing risk of failure of the investment, the increasing risk of premature death, and the amount of foregone earnings from present employment.

Other items which could be related to this relationship for human capital investment come to mind: the state of the person's health, the living environment, e.g., whether that environment places a high value on such investment plans, etc., and the experience in human capital investments of the parents, relatives or other significant individuals in the life of that individual contemplating an investment plan.

The concept suggested in this research of a homo economicus production function is supported by the work of Yorem Ben-Parath (1967). He has utilized the concept of a human capital production function in a manner completely analogous to that for physical capital technologies. He uses it to show how an optimal personal human capital investment path can be determined and how time allocations are made. He also shows how production technology changes, such as factor cost changes, affect the life cycle earnings of the individual. Three market prices are exogenously fed into the model; the rate of interest, the rental rate on human capital, and the price of purchased inputs. He then maximizes the present value of possible earning streams for any time t . His

findings agree with Mincer (1958), that human capital acts like physical capital in many respects, including depreciation, to some degree.

Altonji (1993) looked at the demand for and returns from higher education when individuals were uncertain of the outcome in terms of success in the investment part of the venture, e.g., how they gauged their ability to succeed in an academic environment. The study addressed such effects as family background, whether family members had attended higher educational programs, etc., in gauging the demand for such programs. It did not look at the effects of abbreviated planning horizons nor of intertemporal impatience in forming decisions. But the results agree with those of Becker (1975) regarding the negative relationship between risk in the investment and the propensity to invest.

As mentioned above, Hamermesh (1984), using a person's parental longevity as a proxy, found empirical evidence that individuals will work slightly harder and consume slightly less when they believe they will live longer. This lends support to the intuitive conclusion that planning horizon lengths have a direct relationship on human capital formation decisions, and with the formal model results of the Theoretical section discussed earlier for the model of perpetual youth.

Much of the published research on human capital deals with gender comparisons in earnings for a given human capital investment, in similar comparisons between races, between generations, or in how today's immigrants measure up in comparing their skills to those of an earlier generation. Research which addressed the question of intertemporal impatience in consumption affecting the private decision to form one's own human capital

was not found. Intuitively, the effects would seem obvious. But it might be that the ruling effect is from the length of the planning horizon, and the effects of impatience are entirely within the planning horizon's possibilities, i.e., that the rate of time preference is bracketed within a given planning horizon.

Investments of any kind involve varying degrees of uncertainty in the absence of perfect foresight. Levhari and Weiss (1974) use an investment model of human capital formation in reaching the following conclusions: Human capital investments are risky, in fact, more risky than investments in physical capital. There is also imperfect knowledge concerning the value of possible inputs in their contribution to the formation of capital quality, for example, which graduate school is best for developing a certain desired expertise.

They also state that there is imperfect foresight of future demands for a marketable specialty once developed. To the degree this specialty is a dedicated specialty, that is, one with little value outside of its primary employment, this presents a barrier to exit which could trap a worker in a low-paying position. For example, farming knowledge and expertise might be of little use off the farm or away from a primary agricultural setting. This makes becoming a farmer more risky than it would be if there were many other employments for this knowledge away from the farm. If the farm job is lost, the individual might need to start from scratch and incur large costs developing a new skill to market.

Their model uses separable utility and an exogenously formed market interest rate. It allows for the existence of an initial endowment of human capital and solves for

the expected utility from consumption in a portfolio analysis. Their results are that *increasing the initial endowment increases the rate of human capital investment*; the more wealth stocks an individual has to work with, the more likely s/he will invest in the formation of his or her own human capital. Also, if the individual is a net borrower, a rise in the market interest rate decreases the propensity to invest; but if s/he is a net saver the opposite effect is predicted. For example, if the interest rate on student loans were to rise, and the in-school grace period on interest payments were to be abolished, the authors would predict that, to the extent that a student must borrow to stay in school, s/he might no longer be willing to bear the financial burden.

The prior research reviewed here has looked at parts of what will be used in this chapter. It has established that human capital is much like nonhuman capital in many important respects, and that investments in human capital are riskier than those for non-human capital. It has also established that increasing the size of the endowment given by one generation to the next increases their investment in human capital. The research has shown the relationship that exists between the length of the planning horizon and the willingness to invest in the formation of human capital. The subjective rate of time preference has also been shown to affect investment outcomes.

These elements pertain to the research of this dissertation in the following ways. Changes in the subjective rate of time preference will be shown to indicate the presence of a change in aggregate tastes and preferences, which will change the investment in the next generation that the economy is willing to make. The planning horizon literature reveals the importance of this element in investing in the formation of human capital,

both by individuals in each other, and more importantly, in one's self. It will be shown that, when an individual has a too large subjective rate of time preference and a too small planning horizon, self investment may not take place at all because the concept of investment is a meaningless abstraction for such a person. This leads to economic dependence; in the aggregate the presence of too many dependent agents means that the economy cannot achieve optimal economic growth.

Mathematical Models of Economic Growth

The mathematical modeling of economic growth in its modern dynamic form spans at least seventy years. The Ramsey (1969) infinite horizon growth model was proposed in 1928. That model asked how much an economy needed to save in order to maximize an infinite horizon consumption set. Over the years this and other questions have been modeled by Samuelson, Diamond and many others. Growth theory received a boost from the mathematics profession when Pontryagin, et al. (1962) generalized the calculus of variations into optimal control theory, allowing more complex models to be investigated. Due to the difficulty of deriving closed form solutions for many interesting dynamic economic growth models using even the best mathematical techniques, the phase diagram has been of assistance in analyzing steady states about the region of optimality. Texts exist which introduce the topic of optimal control such as Kamien & Schwartz (1991), and Leonard and Van Long (1992).

To introduce the intertemporal growth model, we begin with a simple infinite horizon Ramsey type model. Assume that $F(k(t))$ is the production function or the output

from capital. It can be consumed as $c(t)$ now or invested to create even more capital in the future. Capital increases over time at a rate of $dK/dt = F(k(t)) - c(t)$.

Thus, k is being augmented over time at a rate of $F(k(t))$ and diminished over time at the rate of $c(t)$. By choosing $c(t)$ judiciously for a given rate of reinvestment for the formation of k , the economy could maintain itself indefinitely. If $c(t)$ becomes too large, $k(t)$ would eventually run out; if $c(t)$ becomes too small, $k(t)$ would increase inexorably over time, eventually weighing down the economy by increasing maintenance costs without bound (dynamic instability), so that everyone could be made better off by increasing aggregate consumption and reducing the rate of capital formation. Thus the time path is integrated as

$$\text{Maximize } \int_0^t u(c(t)) dt \quad (3.1)$$

subject to

$$\dot{k}(t) = f(k(t)) - c(t) \quad (3.2)$$

$$k(0) = k_0, \quad k(T) = k_T \quad (3.3)$$

The second line is called the equation of motion and describes how the state variable, k , changes over time as influenced by the control variable, c .

The solution to this system of equations is a set of permissible differential equations which describe the optimal path through time. Since it is an optimal path that is needed rather than just a scalar, an optimal function, called a functional, is sought. Pontryagin, et al. (1962) developed the concept of the Hamiltonian, a dynamic extension

of the static optimization Lagrangian process, internalizing the external constraint, incorporating it into the objective body of the problem, and gathering the constraint's value in a variable called the costate. The Hamiltonian for this problem is

$$\begin{aligned} H(u(t), k(t), c(t), \pi(t), t) \\ = [u(c(t)) + \pi(t)(f(k(t)) - c(t))] \end{aligned} \quad (3.4)$$

where $\pi(t)$ is the costate variable. This variable acts similarly to the Lagrangian in static optimization. The following set of equations, developed by Pontryagin, et al. maximize the objective function.

$$\frac{\partial H}{\partial c(t)} = 0, \quad \text{or,} \quad = u'(c(t)) - \pi(t) \quad (3.5)$$

$$\dot{\pi}(t) = -\frac{\partial H}{\partial k(t)}, \quad \text{or,} \quad = -f'(k(t))\pi(t) \quad (3.6)$$

$$\dot{k}(t) = \frac{\partial H}{\partial \pi(t)}, \quad \text{or,} \quad = f(k(t)) - c(t) \quad (3.7)$$

These first order conditions on the Hamiltonian have a straight forward interpretation, once the $\pi(t)$ term is properly understood. Recall that the meaning of the Lagrangian in constrained static optimization is the marginal value of an additional unit of the constrained resource to the objective function (Intriligator 1971); in the same manner, though differing in the arguments, $\pi(t)$ represents the marginal value of a

change in capital stocks at time t as it relates to the total outcome over time along the optimal path. This costate variable has an essential function within the equation: since it is the marginal value of a change in the state variable (in this case, capital) it functions to equate all marginal costs and benefits dynamically. This says that the benefit over the entire time line of an additional unit of capital is the change in the amount of utility it affords in the form of consumption, against the cost over time needed to acquire it. Thus, the costate gives the value of a change in the state variable, not at some specific point in time, but in terms of all benefits and costs that accrue over the entire time frame. This is fundamentally different from static optimization, and far more complicated.

It must be emphasized that human capital, intellectual ability, training, industrial expertise, etc, acts in many respects like nonhuman capital. It depreciates over time, it must be continuously maintained lest it depreciate even faster, and is eventually retired or made obsolete via the introduction of newer technological forms. Therefore, the models in this study make no practical distinction between human and nonhuman capital. If capital is assumed to depreciate at some constant rate δ , it must be restored at least as fast as it is depreciating, and as fast as it is being used up in current consumption. In order for the capital-to-labor ratio to maintain productive levels it is additionally essential that the capital stock increase as fast as, or faster than, the increase in the population in the economy over time.

The consumption function is assumed to be convex through the origin and assumes constant relative labor income. The object of the economy is to maximize

intertemporal consumption subject to the above constraints. This is an optimal control problem; properly constrained, there will be a saddlepoint solution functional which describes the path of optimal combinations of consumption and capital formation through time.

It turns out that the characteristic for such an optimal path (assuming that a solution space exists) is the dynamic analogue to the efficiency condition on a static constrained optimum that the marginal rate of substitution in consumption be equal to the marginal rate of transformation in production. It is known as the Keynes-Ramsey rule, and states that *the marginal rate of substitution from consumption between time t and $t + 1$ be equal to the marginal rate of transformation in production between consumption at t and $t + 1$* . Reducing consumption in t gives capital accumulation a boost, so that consumption can be increased in $t + 1$. Along the optimal dynamic path, utility must be equal and maximized at all points (if it were not so, and assuming that the objective functional sought to maximize utility over the entire time path, then some other path would be optimal). The utility of consuming in time t must be equal to the utility of consuming in time $t + 1$. But this could only be true if consumption for $t + 1$ is of equal value *after being discounted back through time to t* . Therefore consumption in $t + 1$ needs to be increased over consumption in t so that its value after discounting is equated.

The discount rate used is the real interest rate, which is the rental rate for capital operating at optimum efficiency. This is added to agents' expectations about the worth of future streams of consumption and costs. θ combines these two elements, subsuming

them under one term. If the present generation does not value future utility possibilities from future consumption compared to current consumption, for whatever reason, θ will be close to unity; if the present generation places a high subjective value on utility in the future, θ will be close to 0. The Keynes-Ramsey rule formalizes this.

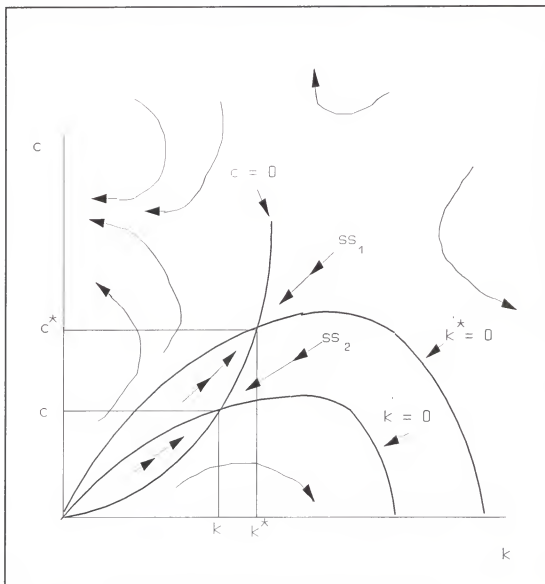


Figure 3.1: Phase diagram of steady state path

Figure 3.1 is adapted from Blanchard & Fischer 1989. Here the vertical axis represents increases from the origin in the level of consumption, while the horizontal axis

shows increases from the origin in the level of capital. The hills on the horizontal axis represent those levels of capital formation from societal wealth, properly depreciated, that are indefinitely sustainable and do not change with respect to time. The actual level of capital corresponding to these collections of points is shown on the horizontal axis.

The large hill of dynamic capital formation, $dk^*/dt = 0$, shows what is possible for an economy which has an efficient system of wealth creation, an economy where most of its members actively produce enough wealth to take care of their own needs, the needs of their dependents and a yielded surplus for future societal capital formation needs. The smaller hill, $dk/dt = 0$ corresponds to the capital formation possible in a society where many of its members are not economically viable, and are therefore not adding to the wealth of society.

Since it is not specified at this point, it is assumed only that the underlying utility function which drives consumption is convex and twice differentiable. The dynamic steady state consumption level shown, on which $dc/dt = 0$, is the Modified Golden Rule (MGR) level and reflects the relative impatience of market agents and the corresponding amount they discounting of future gains from human and nonhuman wealth. The intersection of $dk^*/dt = 0$ and $dc/dt = 0$ establishes the consumption level c^* and the required level k^* necessary to sustain it. Thus, the economy has a self-interested role to play in providing for the formation of its own human capital.

As will be pointed out many times in this study, a society which ignores the ongoing necessity to form human capital because it is dedicating too much of its accumulated wealth to current consumption is in danger of ultimate extinction. If not

enough capital is dedicated to investment (θ close to unity, or agents are refusing to lay aside sufficient capital resources for the economic development of the next generation), the hill of dynamic capital formation might be seriously reduced, to the impoverishment of all society's members over time.

It should be emphasized that in such a dynamic situation, a small change in the economy's initial parameters will have a dramatic effect on outcomes later on. In figure 3.1, only one growth path combination of $dk^*/dt = 0$ (or $dk/dt = 0$) and $dc/dt = 0$ is dynamically stable for capital and consumption; any other path is dynamically unstable¹⁰, or fails to converge. That is, only one path is possible for dynamic balance between consumption and capital formation to be maintained *over time*. The steady state paths both converge from the southwest and the northeast upon the dynamic equilibrium values of the MGR consumption path and the two capital formation hills. The arrows of ss_1 correspond to the steady state growth path for the large hill, and those of ss_2 correspond to the steady state growth path for the smaller hill. As shown by the other arrows in figure 3.1, any other path will eventually cause the economy to head toward extinction. Over-accumulation of capital on the one hand, $dk/dt > 0$, will doom the economy because, as the capital-to-labor ratio increases without bound, the economy collapses under the weight of ever more capital stocks, which, of course must be constantly maintained. The economy then starves to death. This is shown by the

¹⁰ The term "dynamically unstable" usually refers only to the situation where the economy is over accumulating capital, so that everyone can be made better off if consumption is increased and capital accumulation is decreased. Here I have used it in a more general sense, that the economy is not sustainable over time, i.e., that it may either over or under accumulate capital, to the detriment of the economy.

direction arrow combination below the steady state growth path and to the right of the intersection of $dc/dt = 0$ and $dk^*/dt = 0$ or $dk/dt = 0$. No consumption is possible in that case.

Overspending, $dc/dt > 0$, will result in economic collapse from drawing down capital stocks to nothing. The directional arrow combination to the left of the intersection and above the steady state growth path shows this: again, no capital, no consumption.

The Subjective Rate of Time Preference

What was just introduced above is the concept that the prevailing interest rate combines both actual and expected discounted values into one term. The component which gave a measure of agents' estimation of future rewards and costs, θ , is the subjective rate of time preference, and as a measure of human impatience, is specifically represented in mathematical growth models because of its importance in the optimization of global intertemporal utility.

For instance, the Golden Rule level of optimal dynamic capital formation is found by equating the marginal product of capital (which is its rental rate and reflects the social subjective discount rate) to the rate of growth of the population:

$$f'(k^*) = n \quad (3.8)$$

The Modified Golden Rule level of capital stock reduces the Golden Rule level by the inclusion of the subjective rate of time preference to population growth. Then, the marginal product of capital is equal to the rate of population growth plus the subjective rate of time preference.

$$f'(k^*) = \theta + n \quad (3.9)$$

According to the authors

. . . The modification . . . is that the capital stock is reduced below the golden rule level by an amount that depends on the rate of time preference. Even though society or the family could consume more in a steady state with the *golden rule* capital stock, the impatience reflected in the rate of time preference means that it is not optimal to reduce current consumption in order to reach the higher *golden rule* consumption level. . . . The *modified golden rule* condition is a very powerful one: it implies that ultimately the productivity of capital, and thus the real interest rate, is determined by the rate of time preference and n . (Blanchard and Fischer 1989: p. 45)

The words " . . . not optimal . . . " reflect an emphasis on the underlying purpose of all economic activity: individual utility maximization. This is what determines optimality. The model assumes a subjective rate of time preference that is exogenously specified for the purposes of the analysis. The invariance of the subjective rate of time preference within the model is restrictive because it means that intertemporal preferences are fixed over time. This might be appropriate for aggregation purposes where the demographics of the population don't change much over time and tastes and preferences are fixed; but where this is not the case, e.g., where the population is

gentrifying, or there is a shift of the modal age, then *average intertemporal tastes and preferences will not likely remain unchanged.*

A dynamically fixed subjective rate of time preference is also inappropriate where the intent is to model the individual life cycle consumption and wealth creation possibilities. Common observation and experience show that it is not inconsistent to posit that *intertemporal elasticities change as individuals age.* An infant responds to any delays in gratification with immediate displeasure(!), reflecting a high rate of time preference, θ close to unity. As the individual matures and learns that impatience acted upon can have expensive and long lasting negative results, the rate of intertemporal impatience is reduced (θ closer to 0), making it more palatable to the individual to delay gratification when necessary in order that goals important to the agent may be met. Investments, the sacrificing of current consumption for increased discounted future benefits, become rationally attractive.

Endogenous rates of time preference are mathematically complex; for our purposes, the rate of time preference will be exogenously specified. However, it is possible that a piecewise continuous model incorporating a few differing sequential rates of time preference, exogenously specified, could be built. It could be used to investigate a life cycle containing an initial high rate of time preference characteristic of youth, followed by lower and lower preference rates as the individual matures. Such a model could analyze what happens if the expected rate of time preference reduction from

economic maturation is delayed, or, indeed, fails to develop at all in a significant percentage of an economy's population¹¹.

Fundamental Results of the Infinite Horizon Model

According to Arrow and Kurz (Carlson & Haurie 1987),

The infinite horizon is an idealization of the fundamental point that the consequences of investment are very long lived; any short horizon requires some methods of evaluating end-of-period capital stocks, and the only proper evaluation is their value in use in the subsequent future. (p. 6)

As noted above, Ramsey was the first to propose an infinite horizon economic optimal growth model. Assume that $k_0 > 0$ so the economy has some capital to start with, and that

$$f(0) = 0, \quad f'(0) = \infty, \quad f'(\infty) = 0 \quad (3.10)$$

Then the Ramsey problem can be represented as

$$\frac{Max}{K} = \int_t^{\infty} e^{-\theta t} (U(\gamma k(t)) - \dot{k}(t)) dt \quad (3.11)$$

$$and \quad \dot{c}(t) = \gamma k(t) - \dot{k}(t) \quad (3.12)$$

¹¹ DiIulio (i) points to the subjective rate of time preference and the planning horizon being essentially unchanged from what it was when the youth-offender was a toddler as being responsible in and of itself for the worst types of juvenile criminality.

where θ is the subjective rate of time preference and $0 < \theta < 1$.

But this is just (3.1)-(3.3) with an infinite planning horizon. Adding population growth, n , and solving for consumption and for how much to add to capital stock (the only choices), from time $t = 0$ the integral to be solved becomes

$$\max U = \int_0^{\infty} u(c_t) e^{(-\theta t)} dt \quad (3.13)$$

subject to

$$\begin{aligned} \dot{k} &= f(k_t) - c_t - nk_t \\ k_0 &> 0 \text{ given; } k_t, c_t \geq 0, \text{ for all } t \end{aligned} \quad (3.14)$$

This is an infinite horizon objective functional; its special character lies in the transversality conditions for fixed or free time endpoint functionals breaking down when the planning horizon goes to infinity. Tu (1984) states that

The length of the horizon is a crucial factor in the screening of [investment] candidate programs: a shorter horizon favors programs yielding immediate high returns, but growing more slowly, a more distant horizon, on the other hand, will give a higher ranking to programs growing fastest even if these yield lower returns at first. The time t^* at which the cumulative values of competing programs are equal is crucial: which program will be chosen depends on whether $T >$ or $< t^*$. (p.130)

The class of problems investigated here have the time argument entering the functional only in the exponential, i.e., in the discount rate. These are autonomous problems; they allow the evaluation of optimal paths to be simplified; it is only necessary

that the discount rate be nonnegative and that the functional be autonomous for a steady state solution (most likely a saddlepoint solution path) to exist having global asymptotic stability (Leonard & Van Long 1992: p. 289).

Beside their appeal on theoretical grounds, infinite horizon control problems provide a very useful economic result: the optimal value of the control variable at any time t is a function *solely of current values* (Leonard & Van Long 1992: p. 292). Thus, it doesn't matter when the program commenced, only what the initial state variable values were and what the discount rate for the program is. However, unless there is only one state variable the steady state path may not be stable; but with just one state variable, capital, for instance, and the control variable is monotonic, which we have assumed all along, then a saddlepoint steady state is guaranteed (Leonard & Van Long 1992: p. 295; Carlson & Haurie 1987: p. 43).

Returning to equation (3.13), (3.14), what can be discovered about the nature of intertemporal substitution for an infinite horizon optimal control problem? Here we seek to understand the nature of the relationship between present and future agents' intertemporal utility. To do this we apply the maximum principle, eliminate the costate variable and get an expression for the slope and curvature (the acceleration of slope changes) of utility.

$$\frac{du'(c_p)/dt}{u'(c_p)} = \theta + n - f'(k_p) \quad (3.15)$$

(Blanchard and Fischer 1989: p. 40).

This is the elasticity of marginal utility with respect to consumption (how much utility changes for changes in consumption amounts). Of more concern in dynamic analysis is the elasticity of substitution between two points in time.

$$\frac{(1 + \theta)^{-1} u'(c_{t+1})}{u'(c_t)} = \frac{1 + n}{1 + f'(k)} \quad (3.16)$$

This is the Keynes-Ramsey rule mentioned above, in mathematical form.

The Keynes-Ramsey rule shows that *the greater the willingness to forego present consumption for future states of consumption the faster the system converges to a steady state*, since, if the economy were to place too little importance on current valued capital formation, requiring sacrifices of current consumption, the optimality condition might never be met.

If persons are very impatient to consume, so that future consumption is heavily discounted, the economy takes a long time to reach a steady state, and much less time if future consumption is valued more. Indeed, for values of θ close to unity it may not be formed in sufficient quantities for sustainable economic life, especially where autonomous consumption is assumed. The principle which brings together much of what has just been discussed is the Turnpike Principle.

The Turnpike Principle

The maximum principle, with its development of the Hamiltonian, has been used to find optimal characteristics to control problems (Tu 1984; Carlson & Haurie 1987;

Leonard & Van Long 1992). As just shown, if the control variable is monotonic and the functional to be optimized is autonomous with one state variable, then a saddlepoint solution is assured. But, only K_0 is known and not π_0 , due to the lack of transversality (boundary) conditions in infinite horizon control problems, so a complete characterization of the optimal control and costate values is hard to determine (Carlson & Haurie 1987: p. 43). If the costate variable can be reformulated such that $\psi(t) = e^{-\rho t} \pi(t)$, called the current value costate, and the Hamiltonian reformulated into the current value Hamiltonian the resulting set of differential equations assures that there exists some k^* that the optimal path will pass through as a steady-state path, as shown in figure 3.1. Thus, the optimal path must achieve the steady-state path through the saddle point as quickly as possible and stay near it for as long as possible; this is the Turnpike principle (Carlson & Haurie 1987: p. 44-7). Furthermore, not only will the optimal trajectory mean that the associated state variable, $k(t)$, will be determined, but that the control, $c(t)$, is also fully determined (Carlson & Haurie 1987: p. 44).

In fact, since it is true that, for autonomous problems with concave monotonic state and control variables, the value of the costate at time t is determined by the value of the state variable at time t , (Leonard & Van Long 1992: p. 290) then the required costate value for achieving an optimal path can be determined. This lends great power to the rate of time preference in determining outcomes for the system, since it reflects the subjective influences of market agents; as they change so will the subjective rate of time preference, and the trajectory of investment growth, and outcomes for the economy.

The next model construction strengthens the role of this rate in determining outcomes both from a theoretical standpoint and in practical terms.

An Overlapping Generations Model

The improvement of the overlapping generations model (OGM) over the Ramsey infinite horizon model (IHM) is stated by Blanchard & Fischer (1989: p. 91):

The model is widely used because it makes it possible to study the aggregate implications of life-cycle saving by individuals. The capital stock is generated by individuals who save during their working lives to finance their consumption during retirement. . . . the model provides an example of an economy in which the competitive equilibrium is not necessarily that which would be chosen by a central planner. . . . The competitive equilibrium may not be Pareto optimal. Life-cycle savers may over accumulate capital, leading to equilibria in which everyone can be made better off by consuming part of the capital stock.

In the OGM the planning horizon plays an important role in saving, investment and consumption decisions. Over-accumulation of capital is probable because individuals do not know how they will live and must avoid penury in their old age. On the other hand, if individuals don't see themselves living very long this would logically have the opposite effect on their capital formation tendencies, resulting in an unwillingness to invest for future possibilities, choosing instead to consume in the present at high levels, unsustainable for very long.

As in the IHM (infinite horizon model), the subjective rate of time preference plays a central role in long run economic outcomes for capital, consumption and savings. If it affects how much capital is accumulated by any single generation, it thereby, affects

what the interest rate for the economy will be through the transmission of the rental rate on capital to interest rates. This affects savings: If there is too little savings then there will be insufficient capital in the economy for the population, and the rental rate on capital, the interest rate, will be high relative to the labor wage, rate because there will be a low capital-to-labor ratio. This will induce savings---and thus investment---by raising the interest rate. But the end result on the amount of savings and long term investment induced by high interest rates is ambiguous, since it is not known whether the substitution or income effect from increases in savings will prevail. If the induced savings is seen to increase consumption in the future, then the substitution effect dominates and savings increases; if, however, increased savings is seen to increase consumption outcomes for the future and for the present, then the income effect would dominate, raising savings rates for the present but not for very long. This leaves the subjective rate of time preference as paramount in the saving and investment decision.

Over accumulation of capital by any one generation is avoided in life practice quite naturally by one generation leaving excess accumulated capital to their offspring. Not only is capital over accumulation avoided but the next generation is provided with working capital for investment in human capital formation factors, and for the expense of human capital formation itself. A strong bequest motive might cause the OGM to resemble the Ramsey IHM in the limit.

The OGM, because it is a discrete model, becomes difficult to manipulate beyond a few time periods and simple assumptions¹². Therefore, this discussion will be limited to the OGM with bequests, and how the OGM with bequests becomes similar to either the Ramsey IHM or a free endpoint control problem. We begin with a brief look at the general overlapping generations model, then proceed to the model which will be used in this research, the OGM transformed into IHM.

Assume that one generation's utility is formally related to the utility of their offspring. Then, one generation derives happiness in seeing wealth transferred from itself to its heir generation. The amount of happiness so derived is associated with other arguments in the older generation's utility function. Assume further that each generational member has a two-period life, 1, the working period, and 2, the retired period. Thus, c_{1t} is consumption during working life, c_{2t} is consumption during retired life. Persons can be in either t or $t + 1$ time periods. Let the utility of persons born in time t be

$$V_t = u(c_{1t}) + (1+\theta)^{-1}u(c_{2t+1}) + (1+r)^{-1}V_{t+1} \quad (3.17)$$

(Blanchard & Fischer 1989: p. 105). Solving recursively forward yields

¹² Blanchard & Fischer present the OGM transformed into a continuous form through the use of annuity insurance and assumptions on the rate of death in the long run; but this takes the discussion too far afield, and away from the main result that positive bequests have a leveling effect on intergenerational capital levels.

$$V_t = \sum_{i=1}^{\infty} (1+r)^{-i} [u(c_{1t+i}) + (1+\theta)^{-1} u(c_{2t+i+1})] \quad (3.18)$$

(Blanchard & Fischer 1989: p.105). Because of the intergenerational link in the utility function the planning horizon has become infinite, as each generation cares about the utility of the next, and so on. The effect of this result on long run economic outcomes for the society is that each generation, working only for its own happiness actually seeks a dynamic global maximum utility for all generations; positive bequests are the way this result is operationalized in practice. With this important result we are now free to move from a discrete model to a continuous model where the bequest motive will be incorporated into the specified control problem.

The Model

Using results from the preceding section, the model to be used for this investigation is a continuous optimal control problem with positive intergenerational bequests from the former to the latter generation. A per capita model will be investigated. Individual utility is assumed to be a function of individual economic growth, and to some unspecified degree, the utility optimization of their offspring.

Under such circumstances, utility maximization yields a *positive pecuniary link* between successive generations, where the former generation sets aside a positive level of their own wealth for the education and training, that is, investment capital, of the next

generation¹³. In the limit, the model with bequests should act just like the Ramsey model dealt with above.

The presence of positive bequests, in either the factor form or as consumable wealth¹⁴, yield an endowment which increases the wealth creation possibilities of the next generation, and decreases the amount of capital the new generation will need to create on its own. At the same time, this reduces the consumption possibilities of the present generation. For intergenerational exchange to be allowed the marginal rate of substitution in consumption of the current generation must equal the sum of the discounted marginal rate of substitution when the current generation retires. Since former generational bequests have added to the transformation possibilities of the current generation, bequests at time t equal the discounted marginal rate of transformation in production for the next generation (Keynes-Ramsey rule).

The planning horizon of the above integral can be modeled either as free endpoint or infinite. We shall use the maximum principle to mathematically model parents' concern about their children as contained in these questions: What will happen (1) with minimum autonomous consumption requirements being present, (2) a reduction of

¹³ This is not altruism. The former generation knows that it will eventually be dependent on the next generation for necessities they must purchase from them. If there is no one of the next generation capable of performing the necessary services the former generation will suffer loss. Comprehending this, the former generation assures that the next generation is capable of performing these and other services.

¹⁴ The presence of a factor endowment is universal for all persons. There is a large difference, however, in the relative capacity for that endowment to be readily translated into tradable wealth, human or nonhuman, through judicious investments of time and energy.

bequests caused by asserted increased current-generation selfishness, (3) a weakening of links between parental and offspring intertemporal and interpersonal utility, and (4) a concomitant increase in the rate of subjective impatience of the current generation? From what we already know the presence of these elements in the U.S. economy would be expected to inexorably draw its wealth stocks down over time by there being less dynamic capital formation and more consumption. In practical terms, the presence of these characteristics would manifest themselves in society in the increased poverty of children and youth and the increased wealth of the retired and aged cohorts.

Asserted Conditions in the Model

Individual wealth must at all times be sufficient to provide at least autonomous consumption; if the individual does not either inherit it or produce it, then it must be obtained through active or passive dependence, as explained above.

Transversality conditions and the NPG rule hold as before, but savings can be negative. Thus, economic dependence as discussed above will be possible. Per capita investment and savings, however, will always be accompanied by some minimum per capita level of consumption. Investment will be subsumed under $f(k)$ and is irreversible. The interest rate r will be slightly positive.

$$\text{Maximize } V = \int_0^{\infty} e^{-(\theta+r)t} u(c(t)) dt \quad (3.19)$$

subject to:

$$\dot{k} = f(k(t)) + f(k_b(t)) - c(t) - mk(t) - nk(t) - bk(t) \quad (3.20)$$

$$f(k(t)) + bk(0) - c(t) \geq 0; c(t) \geq 0 \quad (3.21)$$

$$bk(t) \geq 0; k(0) = k_0 > 0 + bk(0) \quad (3.22)$$

where m is the depreciation rate, n is the rate of population increase, b is a positive bequest and r is the interest rate. We form the Hamiltonian:

$$H = e^{-(\theta+r)t} u(c(t)) + \pi(t) [f(k(t)) + f(k_b(t)) - c(t) - mk(t) - nk(t) - bk(t)] \quad (3.23)$$

Note that bequest b forms an additional pool of resources for the production function as $k_b(t)$ and must also be supplied for future needs at the rate of $bk(t)$.

Since it has been shown that the current value Hamiltonian allows full specification of the state and costate variable we form it now, with $\psi = e^{(\theta+r)t} \pi(t)$. Then the current value Hamiltonian is

$$CVH = [u(c(t)) + \Psi(t) [f(k(t)) + f(k_b(t)) - c(t) - mk(t) - nk(t) - bk(t)]] e^{-(\theta+r)t} \quad (3.24)$$

As in the discussion of the Ramsey model, the maximum principle specifies that the following first order conditions hold:

$$\frac{\partial(CVH)}{\partial c(t)} = 0 \quad \text{or,} \quad u'(c(t)) = \Psi(t) \quad (3.25)$$

$$\frac{\partial \Psi(t)}{\partial t} = -\frac{\partial(CVH)}{\partial k(t)} \quad \text{or,} \quad (3.26)$$

$$\partial \Psi(t)[\theta + r + m + n + b - f'(k(t)) - f'(k_b(t))] \quad (3.27)$$

$$\lim_{k \rightarrow \infty} k(t)u'(c(t)) = 0 \quad (3.28)$$

As discussed above, a problem of this form has sufficiency for a saddlepoint to exist. Using the first two equations to eliminate the current value costate variable as before the nature of $c(t)$ and its relation to $f'(k(t))$ will be made clear.

$$\frac{d(u'(c(t)))/dt}{u'(c(t))} = \theta + n + m + b - f'(k(t)) - f'(k_b(t)) \quad (3.29)$$

With the phase diagram of figure 3.2 we see the existence of a steady state path converging toward the intersection of $dc/dt = 0$ and $dk/dt = 0$. Keep in mind that the capital formation hill includes both capital from $k(t)$ and from $k_b(t)$. Figure 3.2 shows the steady state path (SS) for the economy described by the above conditions in k and c space rather than in ψ space. k^* and c^* show the modified golden rule (MGR) levels of

capital and consumption respectively. Recall that the MGR level of capital reflects the rate at which discounted capital must form to keep up with increases in the population so that the capital to labor ratio remains undiminished, while also reflecting the subjective rate of time preference.

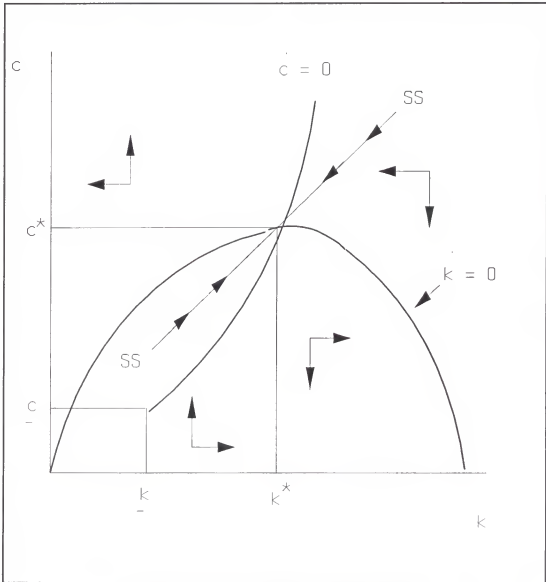


Figure 3.2: phase diagram for steady state

The curvature (the rate of change in the slope) of the production function where $dc/dt = 0$ intersects $dk/dt = 0$ (recalling that total k is $k + k_0$) is $\theta + n + m + b$.

Assume that over the last sixty years θ has been stable at some level such as 1.5%; were θ to rise to 3% it would affect the steady state path of the economy, forcing the $dc/dt = 0$ curve back toward the origin. If, in addition, utility functions became more myopic, reducing the size of bequest b , then the hill of $dk/dt = 0$ would shrink as well. These changes would diminish the steady state consumption level of the economy, c^* , over time. But this reduction in consumption will not be experienced equally by old and young alike; the young will suffer more.

Figure 3.3 revisits the situation described earlier, where the subjective rate of time preference has increased and/or the bequest motive has been reduced, increasing current consumption at the expense of current capital formation (investment) and thus decreasing the size of inherited capital for the next generation's capital development needs.

Values for θ and $k_b(t)$

While these phase diagrams illustrate in a general way how the steady state of the economy is affected by changes in θ and $k_b(t)$ they do not answer the question of what the stereotypical values of the various rates might be from which changes might appear. In a modern industrial state like the United States, expected values for depreciation and population growth are a matter of record but some interpretation, depending on the assumptions used for data manipulation. The interest rate r is a function of the productivity of capital, $f'(k(t))$, which can be inferred from GDP growth. Inflation is also clearly associated with the interest rate. If we use the inflation rate and GDP

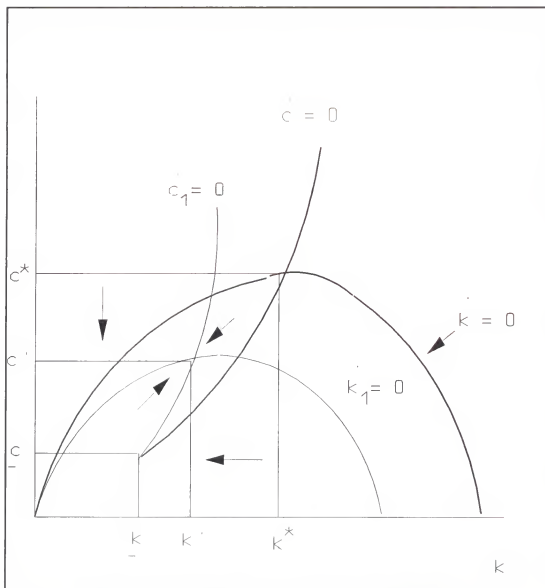


Figure 3.3: phase diagram for shifted consumption path

growth to determine the interest rate, then r is between 2.2% and 2.9% for FY1996.

As to the capital bequested to the present generation from the last generation, arriving at this value is problematic: how can it be known whether the capital currently used has been built up entirely within this generation or is an addition to what had been received from the last generation? Cost accounting provides methods of how to credit the work semi-completed by one shift and inherited by another shift when the production

process is continuous, such as pulp manufacturing or paint production (Shillinglaw), but how would they be applied for a production process as continuous and vast as the output of the United States in determining which generation contributed what to GDP? For the present it is sufficient to know that each generation or cohort of the population does not start with $k(0) = 0$ but with $k(0) > 0$.

The amount of capital any individual leaves to his offspring is a function of his production and capital formation, no matter whether he had inherited the capital or built it all up himself. This in turn is a function of his willingness to invest, to sacrifice current wants for future rewards, which has been shown to be a function of his rate of time preference. Thus, θ controls the size of formed capital any individual has at his disposal.

How much of that formed capital, and the wealth that springs from it, the individual decides to consume and how much to leave to offspring would not seem to be a function of θ because we are assuming an end-of-life decision, so there is no reward---and hence no incentive---for postponing consumption demands any longer. What is involved in the decision to leave wealth to the next generation or consume it now is the extent to which the utility function of the agent belonging to the former generation is formulated to include the happiness and well-being of the next generation, as described above.

The role of the interest rate in altering saving decisions and hence investment had been briefly discussed above; changes in θ can be treated the same way, although with less ambiguous results. Recall that an increase in the interest rate had an ambiguous

effect on changes in savings because it could not be known whether the substitution or the income effect predominated; the subjective rate of time preference has neither an income nor a substitution effect, *per se*. θ is purely a matter of how long the market agent is capable of waiting for an anticipated reward. The size of the reward is only indirectly involved; its timing is the main consideration. This rules out income and substitution effects.

What would an acceptable starting value for θ be? It should be clear from the mathematical and graphical discussion that this value would be in the range of perhaps only 1% to 3%; any value much in excess of this would put the consumption/production locus too far to the left, and a steady state trajectory for economic growth might not exist. The value for θ will be added to the interest rate, the rate of depreciation on capital stocks and the rate of increases in the population. It is commonly known that even small increases in the rate of population growth in excess of capital growth reduces the capital to labor ratio, resulting in diminished living standards over time. It is therefore reasonable from this argument and obvious from the mathematics in equations (3.27) and (3.29) that θ must be treated in the same way.

Discussion

This chapter has shown that while its effects can be successfully modeled and analyzed, causes in changes to the subjective rate of time preference, θ , are not clearly understood, and the overall significance of θ in determining long run economic outcomes is therefore probably underestimated. Its obvious manifestation is in forming the decision

by individuals to consume now or later, and the effect that will have on aggregate capital levels; but far more important is the role it plays in the type of capital being formed, in human capital formation and in the formation of other capital goods. If these goods are not formed in sufficient quantities then the individual decision to consume now or later is made over a much restricted set of opportunities.

It has been argued that the process of investment is learned, as taught by parents or guardians to their children. If these parents or guardians are experiencing upward shifts in θ then the quality of the care and training received by their children will naturally be affected, because such training is itself a form of investment; if, then, their desire to invest is curtailed why should their desire to invest in their children remain the only investment decision not affected? In that case their children may not be able to engage in the process of investment because it was not sufficiently taught.

If the present generation has indeed reduced its investment into the next generation over the last few decades compared to generations of the recent past, the mathematical models presented in this chapter indicate that this trend could show itself in a curtailment on the formation of capital goods, human capital being its most important form. That would mean that the next generation would not be able to become economically mature, dynamically or otherwise. This would leave many of its members in a state of what DiIulio (1996) calls being "radically present-oriented", with a high subjective rate of time preference, with significant numbers of youth being incapable of performing in an economically productive manner, in their being involved with activities

such as drug and alcohol abuse, sexual and criminal activity, all of which promise instant gratification and serious negative long run consequences.

The data presented in the chapter introduction clearly show that the nurturing environment for children has been degraded and their possibilities for achieving a full and fruitful life have been unambiguously reduced. This gives evidence that, as a society, Americans are becoming more self-centered, or more impatient, or more dynamically myopic, or all three.

It is perhaps too soon to know whether this represents a long term shift in economic behavior; but the mathematical models of this chapter make plain that even for short term changes in behavior economic growth will be significantly impacted. The benchmark in economic dynamics is not whether Americans are "doing alright" but how well the economy should be doing given the resources at its disposal. As the number of market agents that are economically dysfunctional rises, the lower dynamic aggregate economic growth will become.

Economic dysfunctionality is not an abstraction; it means more individuals being present-oriented and having utility functions disconnected to the welfare of anything outside immediate individual wants, child criminality, for instance. In fact today's child criminal is a far cry from those of decades past. According to DiIulio,

. . . In particular, work by Fleischer (1995) and other urban ethnographers suggest that today's crime-prone boys are too radically present oriented and self-regarding for any type of criminal deterrence to work.

By radically present oriented, I mean that they are almost completely incapable of deferring gratifications for the sake of future rewards. In their lives, there has never been a stable relationship between

doing "what's right" and being rewarded and doing "what's wrong" and being punished.

. . . the extraordinary degree to which today's young street criminals are present oriented, and the extent to which they do crime for fun as well as for profit, has yet to be taken fully into account by economists. (1996: p. 16-17).

Such would be the logical outcome of children being raised in a society that has become more present oriented and self-regarding, where the subjective rate of time preference has increased and individual utility functions have become myopic. DiIulio warns us that

Models that assume that young urban street predators are but a highly impulsive breed of middle-aged economics professors are not only intellectually idle, but (should anyone actually be foolish enough to act on them) downright dangerous. The reality simply does not fit the theory; economists need a new theory, one way beyond the confines of the Becker model (1996: p. 17)

What common experience teaches is that *now-centeredness is preexistent in human beings*; rates of time preference begin at very high levels in infancy, possibly approaching unity. The process of socialization, training and maturation, ordinarily thought of as the goal of parenting, causes a reduction in this subjective rate of impatience. If children are deprived of parenting, in whatever effective form it may take, there can be little doubt that their children's, and society's, prospects will be diminished, that social and transactional costs will rise and reduce the wealth of present and future generations. The next chapter shows how important family structure is in the maturing life of the individual child.

Is there a crisis in human capital formation due to child welfare reductions brought about by an increase in society's now-centeredness? And if so, why has the crisis in child welfare neither caused widespread concern by the majority of citizens nor played itself out in a noticeable reduction in America's capital growth as measured in the gross domestic product? There are two probable explanations for the latter question: The first is that the United States finds itself at the end of the twentieth century with enormous capital stores, both human and nonhuman, in large part because it had created a vast capital surplus for itself in decades past. After all, at the midpoint of this century the U.S. emerged from World War II the uncontested economic giant of the free world.

With such a surplus of capital in all forms to spend down, and a definite time lag between when factor capital is created and when it yields finished goods and services (especially in the case of human factor capital), it might be some time before it is noticed that the American society is not producing as much human capital as in decades past, or as much as it potentially could, and that as a result the American economy is beginning to decline.

The second reason is related to United States immigration policy. As can be casually observed on any American college or university campus, foreign nationals come to the United States from all over the globe to receive higher education. In many graduate departments, especially those in science and technology, a significant percentage of graduate school student bodies are made up of foreign nationals. Why is this? Because, representing the top levels of scholarship in their own school systems, they are well prepared to enter and perform successfully in American colleges and universities.

Their native elementary, secondary and high schools have rigorously trained them; often they have had to pass national exams in order to go on to higher education in their own country. Not surprisingly, many of these economically viable market agents are inclined to remain in the United States after completing their studies, where their skills and training are in demand.

Also, as has been suspected by American educators and others for some time, fewer American nationals are qualified and prepared to successfully complete bachelor or graduate programs in American colleges and universities. The large federal debt and deficit which currently exists has placed constant pressure on state and local budgets to cut public spending wherever possible. Being difficult to quantify their positive contribution to society and the economy, it is usually programs for the indigent, the old, early child development, family rescue and intervention and education which are cut first. School districts are finding it increasingly difficult to educate their charges, even while the number of aggressive and problem children in their schools is rising as more children are impacted by family dysfunction and other social pathologies. This naturally causes the number of youth prepared for college to be reduced.

While the number of American nationals of the next generation enabled to engage in the formalized development of their own human capital might be falling in percentage terms, and while American society seems disinclined to spend the resources to assure that the task of fitting the next generation for the economic and social realities of life is systematically accomplished, other foreign nationals continue to supply the American economy with human capital, already formed, and for which the U.S. has not had to pay.

It cannot be concluded from this investigation that other national economies are doing a better job of supporting human capital formation than the American economy is presently doing. In this regard, a large percentage of foreign citizens in many lands who have human capital to rent, desire to rent it in the United States, where their utility can be most effectively maximized, according to their subjective judgement, and that this might play a role in American society's interest in educating, reeducating and training its own citizenry. What can be concluded is that the nature of the individual utility function plays a central role in determining living standards for society in the large. The more intertemporally and interpersonally oriented utility functions are, the more likely that the economy will be dynamically prosperous, *ceteris paribus*. The process whereby individual utility functions are formed was suggested in chapter 2; chapter 4 is an empirical test of the importance of background characteristics in altering behavior of youth.

Conclusion

This chapter has modeled the effects of changes in the subjective rate of time preference, in interpersonal utility maximization, and discussed the implications of reducing subjective planning horizons on the ability of an economy to sustain itself over time. If the logic of the above discussion is accepted several conclusions result. One is that while Americans may not notice that their ability to form needed human capital is declining, eventually, *ceteris paribus*, it must reduce consumption possibilities for future generations.

Another conclusion is that immigration is not the enemy to maintaining the standard of living in the United States that some say it is; rather, it is a significant contributing element to the standard of living now enjoyed in America. Liberal immigration policies for the U.S. must not be curtailed in the mistaken belief that such curtailment will safeguard American jobs and living standards since the opposite is true.

A third result is that robbing the next generation to increase the consumption of the present generation accelerates the decline in living standards of the entire society over time. When the retired and elderly cohort of the population becomes richer than the young, as is presently the case, the American economy is in clear danger of imminent decline.

There is an additional ancillary result of this research. Attempting to reduce juvenile crime by increasing the severity of the punishment is a fool's errand. The problem is that children, by their very nature have neither the planning horizon nor the low rate of time preference necessary to comprehend the significance of their nefarious deeds, how much less to be instructed and trained by condign punishment for them. The solution to the juvenile crime problem rests in better child rearing and supervision, and in supporting those programs and institutions for children which increase their consciousness of an extended planning horizon and diminish their subjective rate of time preference.

Beside DiIulio's observations, the analysis of the subjective rate of time preference used in the models presented in this study clearly show that, where it is close to unity, capital formation is drastically curtailed or even impossible. Since all capital

formation begins with human capital formation, we are forced to conclude that a child does not automatically become a rational adult, economically or otherwise, after the passage of a requisite amount time; rationality only appears within the individual's mind as a result of various key inputs, systematically, comprehensively and consistently applied from the earliest years. But beyond private wealth endowments, the next generation stands in need of public wealth in the form of factor inputs, institutions, regulations, and other input forms which facilitate their growth and maturity.

CHAPTER 4

FAMILY ENVIRONMENTS AND AT-RISK BEHAVIORS BY YOUTH: AN EMPIRICAL STUDY

Introduction

This is a study of the relationship between supportive family attributes for an eighth grade cohort, and their later possible involvement in drug and alcohol use, criminal activity, sexual activity and antisocial behavior, collectively called "at-risk" presence of the family background characteristics of an eighth cohort and the extent to which these youth will exhibit a propensity to engage in one or more of the at-risk behaviors after the passage of four years.

In this chapter I first cite studies, including data from the Bureau of the Census, which point to a significant decline in the number of two parent families over the past few decades. I also discuss other studies which indicate that during this same period of time child welfare may have declined, according to specific measures such as the rise in the number of children living in poverty or who are actually homeless. Other citations discussed below indicate that there has also been a concurrent increase in violence by and toward children, gang activity and anti-social behavior, drug and alcohol use and criminal activity.

Following the literature review, the theoretical underpinnings of the study are discussed. This places the study in the economic context, relating the investment of

parents in the lives of their children to their children's later economic success, and to the economic success of the aggregate economy. A discussion of the hypotheses to be tested, study results, analysis and discussion follow.

Literature Review

It is impressive how many of the recent studies of adolescence and youth, only a few of which are cited here, include the word "crisis" or "risk" in their title (Lerner 1995; Dryfoos 1990). Interest in the topic of how family structural changes have negatively affected the lives of children is widespread. Studies of the effects on children and youth of being raised by a single parent, or being the offspring of divorced parents, include those of Wallerstein (1989) and Hetherington & Arasteh (1988); similar studies exist for youth drug and alcohol use (National Survey Results on Drug Use), criminality (DiIulio 1996, ii) and youth gang activity and anti-social behavior (Thornberry et al. 1993).

The Rise in Single Parent Families

The number of children living with a single parent has increased dramatically since the 1960's.

In the 1985-89 period, there were about 2.2 million premarital births compared to about 700,000 premarital births for the 1960-64 period. . . . Between 1970 and 1990, the proportion of two-parent family groups has declined for Whites, Blacks and persons of Hispanic origin (who may be of any race) while father-child and mother-child family groups have increased (Bureau of the Census 1992; p. 11). Mother-child family groups

have increased most dramatically due to the rise in divorce and births outside of marriage. (Bureau of the Census 1992: p. 20)

Norton and Miller (1992: p. 9; p. 12) state that

Premarital childbearing, separation and divorce have caused one-parent family groups to become much more prevalent (and accepted) in the United States in the last 20 years. Now, about 3 out of 10 family groups are maintained by just one parent, but in 1970 only 1 out of 10 were. . . . These societal changes have led to American children today living in increasingly varied and complex living arrangements.

Just being a child experiencing the divorce of his or her parents can itself have profound negative effects on children and youth. A longitudinal study by Wallerstein (1989) of the aftermath of divorce, which follows subjects for fifteen years, sheds light on the problems of family logistics, i.e., the ease with which children can access their parents. Divorce challenges parents who want to continue to raise their children with the participation of both parents because the divorce does not necessarily mean an end to the disputes which caused the divorce in the first place (p. xviii). The study concentrates on the effects of divorce on children, showing that these effects in terms of their long term consequences have been too little regarded by social scientists in the past (p. xi).

A significant difficulty with single parent families is the increased likelihood that they will be poor. According to their Summary and Findings, the Kids Count Data Book (1994) states that

Children growing up in single parent-households typically do not have the same economic, housing, or human resources available as those growing up in two-parent families". For example, the most recent national figures

from the Census Bureau indicate that among families with children, the poverty rate for single-parent families is 42 percent, compared to 8 percent for two-parent families. (p. 16)

In addition, the report states that public assistance programs are not capable of eliminating this poverty; few single mothers receive any child support while almost none receive full child support (p. 16).

For those single parent households resulting from out-of-wedlock births to teen mothers, the Kids Count Data Book (1994) states

. . . children born to single teen mothers "are more likely to drop out of school, to give birth out of wedlock, to divorce or separate, and to be dependent on welfare." . . . Families where there is only one adult worker are likely to have low incomes. In addition to being young and unmarried, the mothers of these babies are often uneducated. given the changing nature of our society, parents with low educational attainment are likely to have increasing difficulty in today's labor force. These parents will have to struggle especially hard to provide the economic and human resources that lead to successful child development. (pp.12-13)

Single mothers are at risk for increased psychological stresses, "intensified if they are poor and live alone with their children" (McLoyd & Wilson, p. 108).

Poverty is seen as a problem for children by social scientists because of its perceived over arching influence on young lives. McLoyd & Wilson state that "The most glaring ongoing stressors [of living in poverty] derive from the ecological context---inadequate housing, environmental instability, and, in urban settings, dangerous neighborhoods" (p. 105).

It is reasonable to conclude on the basis of studies directly linking negative emotional states and punitive, nonsupportive parenting that environmental and psychological distress partially account for well-established social class differences in parenting behavior. Numerous studies employing interview and observational methods report that mothers who are poor are more likely than their advantaged counterparts to use power assertive techniques in disciplinary encounters and generally are less supportive and affectionate toward their children. . . . Child abuse is reported to be more prevalent among the poor as well (e.g., Daniel, et al., 1983; Garbarino, 1976). . . . Hence, as suggested earlier, there is good reason to believe that the higher levels of psychological distress deriving from the dangers, hassles, and inconveniences that mark day-to-day existence in the context of poverty is a major factor that explains why poor mothers are less nurturant, less supportive, and less inductive in their parenting than their middle-class mothers (p. 110-111)

The authors add, however, that ignorance of proper parenting techniques is not automatically attributable to poor mothers. They are often fully aware that their children do not always receive proper nurturing and care from them; but the press of circumstances overwhelms their own better judgement, making them simply reactive, rather than proactive (p. 111).

The increase in children in poverty

Increases in child poverty is a cause for concern among social scientists. Lugaila (1992: p. 48) states that young children are the most likely population cohort to be living in poverty. "Twenty-five percent of children under age 3 lived in poverty, and 22.1 percent aged 3 to 5 years lived in poverty, compared to 17.3 percent for adolescents age 12 to 17." According to Ozawa (1993: p. 518)

In 1990, 20.6% of all children in the United States were poor, compared with 15.1% in 1970. Children were the poorest demographic group in

1990. In contrast, only 12.2% of the elderly were poor in 1990. These figures indicate a great transformation in child poverty---until 1973, the poverty rate of children was always lower than that of the elderly.

Segal (1991: p. 455, Table 3), cited data which shows that child poverty decreased during the 1970's, falling to 17.1% in 1975 from a high of 26.9% in 1960, only to increase again to 19.6% in 1989.

Children of young parents and those living in female-headed households are at greater risk of living in poverty, but *the poverty rate of any household with children is three times greater than for households without children*, (italics mine). (p. 456)

At the same time, the percentage of families with children receiving social program transfer payment assistance, such as Aid to Families With Dependent Children (AFDC), decreased in the 1980's. In 1987, only 56% of poor families were enrolled in AFDC, and for 1980-1987 the mean was 56.0% as compared to 73.6% for the 1970's. In addition,

In spite of the importance of AFDC for millions of families, the program does not provide adequate resources for a family in poverty. From 1977 to 1986, AFDC payments did not keep up with inflation (Congressional Budget Office 1988). From 1970 to 1988, the median state monthly benefit after inflation dropped 36 percent. (Segal 1991: p. 456)

The increase in homeless children

Related to the poverty rate among American children is the rate for children actually homeless. Whatever negative effects obtain from being poor these are

compounded by homelessness. Maston et al. (1993: p. 335), evaluate various measures of child well-being for children living in homeless families. They state that

In the past decade, there has been an alarming increase in the number of homeless families with children and, concomitantly, a growing concern about the welfare of children living under such precarious and marginal conditions (Institute of Medicine 1988). In a status report from the U.S. Conference of Mayors (1989), it was estimated that 36% of all the nation's homeless were families, and well over half of those family members were children. Nationwide, it has been estimated that 100,000 children may be homeless with their parents on any given night.

According to the authors, among measures of child psychological welfare such values as stressful life events were twice as high for homeless children than for children living in a home. In their discussion, they state:

Results suggest that homeless children have greater stress exposure and fewer resources than low-income children of similar background in whose families have housing. Even among very poor families, homelessness appears to be associated with lower income and more recent adversity. Homelessness in children was also associated with disrupted friendships and more school changes.

As we hypothesized, child behavior problems were significantly higher in the homeless sample than in the normative sample . . . , particularly in the domain of antisocial behavior . . . Comparing homeless with housed children . . . the pattern of scores suggested an underlying continuum of risk, with homeless children at greater risk. (Maston et al., p. 341)

In a review of statistics concerning the social well-being of homeless children, Kline (1990: p. 110: p. 114) reviewed various studies in order to bring together the various findings in this area. Under the heading of "Health," infant mortality rates in New York City, studied for a cited 1987 survey, were found to be 24.9 per 1,000 for

the homeless sample as compared to 12.0 per 1,000 for the housed group. Homeless children also suffered from nutritional deficiencies for various vitamins and minerals. As the authors state:

Thus, it is hardly surprising that data from another New York stud[y] suggested that homeless children are at risk of delayed or stunted growth, even in cases where low birth weight, gestational age, or parental drug use are not suspected (Fierman et al., 1989). . . . Of course, extended periods of malnutrition can have lifelong repercussions. (p. 111; p. 114)

They go on to show that homeless children, when compared to children living in their own homes, increasingly are not immunized, have elevated lead levels, become ill more often, and will be less likely to receive adequate medical attention in general.

Under the heading "General Development," the authors draw our attention to how the homeless environment could impact on the character development of children. Parent-child interaction was also noted to suffer for homeless children. The stressful conditions created "emotional ambivalence" of some homeless preschoolers toward their mothers (p. 115).

School attendance for homeless children was noted by the authors to range in estimates from a low of 43.7% to a high of 70.0%. However, the older the child, the less likely that s/he would attend school (p. 116). Other measures of educational performance, such as difficulty in grade retention, poor academic performance, and the need for special education were found to be uniformly greater for homeless children than for children living in homes.

Changes in the federal welfare laws for 1996 overhauling the system place requirements on recipients to perform work. In addition, a five year lifetime limit has been placed on all users. This could place additional economic stresses on single parents with young children, especially where they live in economically blighted urban or rural areas where jobs are scarce.

The increase in violence toward children

Violence toward children by care givers is a disturbing reality for many children. Possibly more disturbing is that this tendency seems to be occurring for children at earlier ages. In a recent study, Wolfner & Gelles (1993: pp. 209-10) state that in 1975 male teens were the most likely target; but by 1985, male preschoolers were the most likely targets of abusive violence. In their conclusion the authors state:

Our data are consistent with a structural social model of family violence, where social and economic stressors are positively correlated with abusive violence. The youngest, poorest, most socially isolated and economically frustrated caretakers are the most likely to act violently toward their children.

But while it is quite clear that certain stressors escalate children's risk, abusive violence crosses all social, racial, religious, educational and financial boundaries, albeit, not evenly. . . . The potential for acting abusively is present in many individuals in Western society, but to varying degrees as result [sic] of social learning. Social or psychosocial stresses only exacerbate those tendencies and beliefs, and result in violent attempts to resolve social conflicts. . . . (pp. 210-11)

Increases in At-Risk Behaviors by Youth

Concurrent with these changes in the American family have been an increase in youth involvement in at-risk behaviors such as drug and alcohol use, sexual activity,

criminal activity, and youth gang and anti-social behavior. The following data show that the rise in at-risk behavior has often been dramatic.

The increase in youth drug and alcohol use

According to the Uniform Crime Reports for the United States, 1994, arrests for drug related charges between 1985 and 1994 rose 66% for persons under 18 years of age compared to an increase of 60% for those over 18 years old. However, between 1990 and 1994 drug arrests for persons under 18 years of age increased 88.9% compared to 14.2% for those over 18 years old. To put these statistics in context, there has been a general decrease in reported illicit drug use by high school twelfth graders since a high of almost 60% in 1979. By 1992 drug use for high school seniors dropped to about 25%. But in 1992 this reduction ceased and drug use began to rise once again (National Survey Results on Drug Use).

The rise in youth sexual activity

Literature cited above spoke of the rise in out-of-wedlock births to teen mothers over the past years, and associated this with an increased chance that the children of these teen mothers will themselves become teen mothers (Kids Count Data Book 1994). Both these data clearly indicate that there has been a dramatic rise in youth sexual activity over the last few decades.

The increase in youth criminal activity

Juvenile arrests for homicide, forcible rape, robbery and aggravated assault for American teens rose 67.6% from 1984 to 1993. Property crime among teens rose 9.9% during this same period (Uniform Crime Reports; p. 221, table 32). This compares with a 46.2% and a 14% increase respectively or those over 18 years of age from 1984 to 1993. The increase in just homicides committed by teens during this time is 167.9% compared to an increase of 12.8% by those over 18 years old.

DiIulio calls the situation facing America at present with respect to juvenile criminality as a "ticking crime bomb," (1996, i: p. 4). He says that not only is juvenile crime rising rapidly but the rise in violent crime (as shown by the above data) is rising the fastest of all categories, and that today's young criminal is far more violent prone than those of past generations.

DiIulio (1996, i) also points to parental consistency as being central in forming the ability to learn in children; the failure of providing consistently applied rewards and punishments can be devastating.

Describing crime-prone youth, he says

Many, in some cases most, of the adults in their lives have been persons who are themselves deviant, delinquent or criminal. Such discipline as they may have received at the hands of parents or other adults has been almost purely arbitrary: the first three times they commit a prohibited act, nothing happens; the fourth time they get screamed at; the fifth and sixth times, nothing happens; the seventh time they get punched in the head; the eighth time nothing happens; and so on. (p. 16)

The increase in youth gang activity

Youth gangs are increasing in power and influence, sometimes competing with parents or guardians for their children's allegiance and sometimes replacing the parental role entirely. Hunzeker (p. 29) quotes Ronald Huff, director of the Criminal Justice and Research Center of The Ohio State University, as stating that

. . . where neighborhoods, schools and families have decayed or dispersed, youths look for other means of esteem-building and social identity. Gang association and crime become attractive options where legitimate economic opportunities are lacking and social order is weak. Typical gang activities mirror the need for economic and social identity.

A study by Thornberry et al. (1993: p. 56) investigates the role of gang membership in facilitating delinquent behavior. It asks, "Do delinquents predominantly become gang members, or does being a gang member lead to heightened levels of delinquency?" This study of causality opens with this statement:

Criminological research has clearly demonstrated that gang members are more likely than nongang members to commit offenses, especially serious and violent offenses, and to do so with high frequency . . . This relationship is remarkably robust, being reported in virtually all American studies of gang behavior regardless of when, where, or how the data were collected (p. 56).

"This . . . is hardly surprising because gangs are groups that are organized to some extent around delinquent conduct."

Therefore, the presence of gangs in the environment of youth unequivocally erodes their quality of life. Where gangs become a force within schools, they can be expected to be just as corrosive on the educational experience of children and teens.

Economic Significance of the Phenomena

An important aspect of these behavioral problems of youth is the extent to which they negatively affect their progress in the system of formalized education, and the extent to which the presence of youths having these problems negatively affects the educational experiences of all other participants in secondary education. As explained in chapter 2, not only will these youths fail to enrich society, but they themselves would become in some way dependents on existing wealth stores, diminishing economic growth and stability inexorably over time. The aggregate impact of this was analyzed in chapter 3.

Theoretical Underpinnings.

This section develops the theoretical basis for the study. It begins with a brief discussion of the nature of capital goods formation, both human and nonhuman, and how they are used in the economy. Next, the discussion focuses on how human beings become transformed into capital goods, market agents and production factors, and why it is essential that they do so for the economy to sustain itself. Finally, it discusses how the variables used in this study came to be of interest.

Neoclassical Investment Theory

It can be shown that all economic growth and wealth creation is the result of sacrificing current wants for the meeting of perceived future needs. In an informal sense, this describes an investment process. More formally, *investment is a program of intertemporal wealth allocation undertaken to maximize utility over many interdependent*

market periods. The incentive to invest is that investments can earn a return greater than what their return would be if consumed immediately.

Implicit in this discussion is the dynamic nature of economic growth. If the economic world were static, there would be no investment program, since the process of compounding would not exist, and there would be no economic growth. A dynamic economic world implies growth, the rise and fall of innumerable institutions, product improvements, new technology, the increase and decrease of wealth stores, population growth and decline, and the maturation and metamorphosis of generations of human beings from dependents--whether they be children or immature adults, to fully economically viable adults affecting economic outcomes. In such a world investment is essential to all these processes, making its requirement preexistent.

This growth and decay can be modeled using an exponential function, where wealth is compounded over time exponentially. Human capital potential is an intangible in many important ways; the relationship between this potential and its later realization is stochastic at best. However, there is no reason why its growth and decay cannot also be modeled exponentially. This is, in fact, how it is treated in the literature (Blanchard & Fischer 1989; Leonard & Van Long 1992).

The supply of demanded goods and services requires production to have occurred. The production of goods and services entails a constrained production function, with factor arguments, detailing how production will proceed. Investment is the process whereby capital goods are produced, and human capital is arguably the capital good on which all other capital goods depend.

Human capital formation and investment

Human capital formation begins with other individuals and groups investing their wealth, in whatever form, in the individual in question. At a later age, when the individual has attained a degree of independence, self-investment occurs. At that point the presence in the individual of tastes and preferences which encourage such actions are fully operational, and the individual apprehends and has internalized the investment concept, with its emphasis on sacrificing current wants for the realization of future rewards.

With respect to individual economic capacities, three conditions are possible for any person having reached economic maturity¹: (a) the individual is dynamically surplus-generating, i.e., is capable of meeting all present and future needs for himself, supports other dependents and adds to the wealth of society at large; (b) the individual is just capable of being dynamically self-supporting but is incapable of supporting others or adding to the wealth of society; (c) the individual is incapable of being dynamically self-supporting and must be supported by others in society, by whatever means.

Various behaviors are found to increase the costs of all transactions by acting as a tax on the exchange, raising the price demanders must pay while lowering the returns suppliers receive. These behaviors include shirking, defrauding, withholding information, etc. To reduce this "tax" over time, society could increase the number of

¹ Economic maturity is here defined as having already received and fully benefitted from whatever investments have been made by others, or by his or her self, for the formation of his or her own human capital; and having paid off those investments to whatever extent possible, or to the extent (s)he was willing, according to his or her tastes and preferences, to do so.

individuals in the economy who eschew such behavior and decrease the number of those who do by investing in institutions supportive of this goal, e.g., by appropriate education for the young. Reder (1979), in his essay on the positive role of morality in economic society, has said

If a community were collectively rational it would try to raise its moral tone. To effect this, it would be necessary to *produce* transactors who were more moral. (Use of punishments and rewards is no substitute; they affect behavior *given* preference functions. The problem is to alter the preference functions themselves.) To understate the matter, the technique of producing better and worse "character" in individuals is not well understood. However, there is strong consensus which I think would be widely shared in all societies, that character is somehow produced in childhood and youth; i.e., in the "formative years." Accordingly, one would expect that the Central Authority (not necessarily the state), would be much concerned in this production process; and it is and has been. (p. 144-5)

The costs for such public funded support would not be difficult to justify, if it can be shown that these education costs in fact represent an investment that is capable of paying dividends (discounted benefits), over many generations. The returns would show themselves in two ways. Efficiency in market exchanges would increase, allowing the economy in question to operate closer to its production possibilities frontier rather than interior to it. This would lead to an increase in the potential of the economy for all forms of production. For instance, experience and common knowledge show that the institution of the family has a strong influence on the future behavior of the next generation. It affects the extent to which children and youth form a sense of the future sufficient for them to comprehend and appreciate the process of investment in themselves and other things. The act of investing is thus *learned behavior*, taught by one generation

to the next. If it is not taught and learned then the result on the next generation quite possibly is the manifestation of a behavior characterized by radical impulsiveness (DiIulio 1996, i).

Humans as capital goods

While labor in all its myriad forms is a production factor, laborers and persons are not synonymous. As reasoned above, persons must become a unit of the factor of labor through internal and external investments. For those unable for whatever reasons to become transformed into economically viable adults in this manner, their future prospects in a modern economy are grim.

The importance of proper child welfare values for maximal human capital formation is the following. When youth involve themselves in risky behaviors, a decline in the formalized creation of their own human capital is expected, since these behaviors result in missed school and training days. The more school days missed, the harder it becomes to keep up with assignments and the more difficult it becomes to do well on tests, exams, and other ranked performance tasks. If the situation continues, the student's entire schooling or training career may be threatened, and it may become impossible for youth to successfully accomplish any goals within a structured learning environment.

Social and family capital: their role in human capital formation

Becker (1975) discusses human capital formation from a self-investment perspective, where the object for the rational individual is to maximize potential earnings over the life cycle. There is no discussion of the set of tastes and preferences the individual works with in making such decisions; they are assumed to be supplied exogenously to the market and are treated as data. This study investigates the process whereby such tastes and preferences that pertain to self-investment decisions are formed: what life influences are involved in this process?

The rational individual begins as a helpless infant, totally dependent upon others for all needs. The family, of whatever form, is the chief provider of these needs, at least in the earliest years of chronological life. Later on other sources are present to continue the maturation and education of the individual. But the family is still called upon to fill this role periodically, often beyond early adulthood in some cases. The role family life plays in the formation of human capital in the next generation is understood by looking at the separate components possessed by the family which can be brought to bear.

Following the rural sociology literature (Beaulieu and Israel, forthcoming; Israel and Beaulieu 1995; Smith, et al. 1995), let the human capital possessed by the family be divided into the following components. (1) Structural elements refer to the presence of the parents in the home and the number of possible siblings. These define the opportunities for interaction between the child and the parent(s). The absence of one or both parents, or the presence of numerous brothers and sisters limit the opportunities for close interaction between the parent(s) and the child. (2) Processural elements include

parental regulation of the behavior of the child, limiting television watching, making sure homework is completed on time, etc., discussing school and nonschool activities with the child and offering guidance and counseling. (3) Parental human capital includes formal schooling completed and degrees earned by the parent(s). It also includes the store of life wisdom possessed by the parent(s) which can be used for the benefit of the family members. (4) Family economic capital refers to family money income and the earning capacity of the family members who provide for it. (5) Finally, there is family community capital, which refers to the family's integration with the community it which it is embedded. This refers to church activity, community group activities, etc.

The sum of these family components provides the wealth of capital available to the family in forming the human capital of its dependent offspring. It also provides a context in which to categorize survey questions and responses in order to reflect family capital components. From such responses variables can be formed that represent a family capital component. Regressing the at-risk behaviors on these variables will provide information on the relative importance of each capital component in reducing the likelihood that youth will become involved in at-risk behaviors.

Objectives of the Research

The present study attempts to model the effect of a selection of family background capital forms on the likelihood that children will engage in at-risk behavior. Because it models the separate components of family capital, such as structural components,

processural components human capital, economic capital and community capital, it attempts to show the relative importance of the modeled components and capital forms.

This study differs from other studies in being able to model many child environment input variables in a disaggregated, overall regression that measures their separate effects on the dependent variables of the likelihood that children will become involved in at-risk behaviors. It is hoped that this can yield a measure of the relative importance of parenting and other inputs in the maturing lives of children.

The Hypothesis

What is being tested is whether the background of family capital components for an eighth grade cohort, such as parental oversight, parent-child activities, parental marital status, single parenting, family income level, religious activities, and other variables to be described below, affect the likelihood that the children will become involved in the at-risk behaviors of drug and/or alcohol use, sexual activity, criminal activity, and youth gang activity and anti-social behavior four years hence. The scope of the data available from the NELS 88 study, to be discussed below, on children *in the eighth grade* allow for a test of the response that their family background characteristics have on their participation in at-risk behaviors *once they reach the twelfth grade*. The effects of homeless on eighth graders is not tested, nor is there a test involving the effects of violence toward children.

This study tests the specific effect of family money income on an eighth grade cohort, as distinct from other income forms; that is, it tests whether at-risk behaviors by

youth fall when family money income rises. It also provides a direct test of the hypothesis that the increase in the number of single parent families leads to increases in youth at-risk behaviors. It also tests the following questions. (1) Does the involvement of the father in the lives (life) of his children (child) reduce their (his/her) propensity to become involved in at-risk behaviors? (2) Does the parents being married to each other reduce the likelihood that their children (child) will become involved in at-risk behavior? (3) Does religious activity in the home reduce the likelihood that youth will become involved in at-risk behaviors? These and several other family background characteristics being present for children in the eighth grade will be tested as to their ability to reduce youth at-risk behaviors of teens in the twelfth grade.

The tests will be conducted as follows. Background data for an eighth grade cohort is gathered which gives information on family structure, income, parental status, parental education, and many other background characteristics. After the passage of four years, when the youth from the background study have, or would have, entered the twelfth grade, these same youth are asked about their activities pertaining to involvement in the at-risk behaviors of drug and/or alcohol use, sexual activity, criminal activity, and street gang and anti-social behavior. Each test mentioned above is identified with a specific variable. The marginal effect of the variable in question in reducing the at-risk behavior by youth is measured and signed. This will allow direct and specific tests of the above hypotheses over each at-risk behavior in turn.

Data

In 1988 the National Center for Educational Statistics (NCES) at the United States Department of Education (USDE) began to survey a cohort of about 25,000 eighth grade students from diverse backgrounds in about 1,000 public and private schools for a longitudinal study that would follow their progress through high school and beyond, called NELS:88 for National Educational Longitudinal Survey commencing in 1988. Questionnaires were used to illicit information on the students themselves, their schools, their teachers, their parents and family characteristics. NELS:88 tracked this cohort, using identification numbers for each individual over time, reexamining conditions with follow-up surveys every two years. It integrates the life characteristics of the cohort members with their educational and social progress, including whether they dropped out of school. Survey design also followed that of earlier NCES studies, such as the NELS:72 and HS&B (High School and Beyond) studies. Ad hoc weights are provided to boost the response numbers of some otherwise under represented groups, such as Native Americans, so that they can coincide with their actual percentage in the American population. This study does not use them; results reflect those for the given sample, which is deemed useful enough, given the large sample size.

The Second Follow-Up study of the NELS:88 survey is used to form the left hand dichotomous variables of the at-risk behaviors of drug and alcohol use, sexual activity, criminal activity and youth gang and anti-social behavior. The Second Follow-Up was performed four years after the original NELS:88 survey on the same cohort of eighth graders. Identification numbers were used to assure survey continuity.

This data set allowed separating the effect of the presence of the father in the home, as distinct from the presence of the mother in the home, on youth at-risk behavior tendencies, as the following example shows. The survey respondent was asked to state his/her relationship to the eighth grader named in the study. Then the respondent was asked to give the amount of time the eighth grader lives with him/her. the choices were all of the time, most of the time, some of the time, or none of the time. Whatever the answer given to the first question, the answer to the second question was that the child lives with him/her over 98% of the time. Therefore, DADHOUSE, the respondent identifying himself as the father, and MOMHOUSE, the respondent identifying herself as the mother, unambiguously give the length of time the child lives with the father and the mother separately, when the answer to this survey question is combined with the information given by the respondent in answering the second question.

Because the answer to the second question, "how long does the child lives with you", was over 98% of the time, those few answering "most of the time" were combined with those answering "all of the time", and scored as "1"; those few answering "some of the time" were combined with those answering "none of the time", and scored as "0". This yielded a dichotomous response variable. Other responses were more straightforward; Responding "yes" to the question of whether the respondent is married to the partner with whom s/he lives, MARRIED, received a "1", while a "no received a "0". A full description of the actual questions asked and the way the responses were coded for use in the model is contained in appendix A.

The Model

Regression analysis is used to explore the links between family background characteristics of the eighth graders with at-risk behaviors of that cohort as twelfth graders four years hence. The independent variables are scores from observed activities, usually ordered observations, e.g., the respondent lives with his or her parent or parents all of the time, most of the time, half of the time, less than half of the time, or none of the time; the parent helps the child/student out with homework twice a week, twice a month, never, etc.

The dependent variables are dichotomized so that the child is either having a problem or not having a problem. The threshold values that determine whether there is a problem or there is not are based upon responses to questions about involvement in these activities; a score is obtained and that score is used to determine if the respondent is considered to be involved in the at-risk behavior in question.

Because the left hand side is dichotomous, the regression is nonlinear in form and ordinary least squares will not provide useful estimators (Maddala 1983). Instead, with a normal error term assumed, a dichotomous probit model technique is used to regress the four dependent variables in turn on the set of explanatory variables. From Maddala (1983) the likelihood function for the estimators is

$$L = \prod_{y_i=0} F(-\beta'x_i) \prod_{y_i=1} [1 - F(-\beta'x_i)] \quad (4.1)$$

where

$$F(-\beta'x_i) = \int_{-\infty}^{-\beta'x_i/\sigma} \frac{1}{(2\pi)^{1/2}} e^{(-t^2/2)} dt \quad (4.2)$$

and x is the independent variable.

Probabilities of being in one of the at risk behavioral categories for various levels of the explanatory variables present will be estimated at the mean values of the explanatory variables. The derivatives of the likelihood estimates of the coefficients yield the probability of being in one or the other of the dichotomous groups. This will give a measure of the strength of response for the presence of the independent variables, e.g., what the probability of being criminally active is, when the child lives with his father most of the time.

Estimated equations

Having a drug and/or alcohol problem, being sexually active, being criminally active, or in a street gang or exhibiting anti-social behavior, are systematically related to a set of family background characteristics structurally important in raising children.

$$\begin{aligned} Y_i = & \beta_{0i} + \beta_{1i}DADHOUSE + \beta_{2i}MOMHOUSE + \beta_{7i}TALK_SCH + \\ & \beta_{8i}TLKPLAN1 + \beta_{9i}TLKPLAN2 + \beta_{10i}MOM_ASCH + \beta_{11i}DAD_ASCH + \\ & \beta_{12i}STU_PLAS + \beta_{13i}PAR_ATTD + \beta_{14i}PAR_OVER + \beta_{15i}ITEMS + \\ & \beta_{16i}PAR_EDUC + \beta_{17i}DROP_SIB + \beta_{18i}MARRIED + \beta_{19i}RELIG + \\ & \beta_{20i}CULTURE + \beta_{21i}PAR_EXP + \beta_{22i}UNEMPLOY + \beta_{23i}BOTHWORK + \\ & \beta_{24i}FAMINC + e, \end{aligned}$$

where Y_i = one of the at risk behaviors of drug and alcohol use, criminal activity, sexual activity or youth gang and anti-social behavior, defined here as antisocial behavior; **DADHOUSE** = the amount of time the child lives with the male parent; this variable tests the hypothesis that the amount of time the father and the child live together is important in reducing youth at-risk behavior. **MOMHOUSE** = the amount of time the child lives with the female parent; this operates just as **DADHOUSE** does. **TALK_SCH** = whether and how often the parent(s) discuss school with the child; **TLKPLAN1** = whether and how often the parent(s) discuss high school plans with the child; **TLKPLAN2** = whether and how often the parent(s) discuss college plans with the child; **MOM_ASCH** = how often the female parent is home when child comes home from school; **DAD_ASCH** = how often the male parent is home when child comes home from school; **STU_PLAS** = whether the child has a particular place to study; **PAR_ATT** = whether the parent(s) attend a school event at the child's school; **PAR_OVER** = a composite containing normalized scores for whether the parent(s) set rules in the following areas: how late the child can watch TV, how many hours the child may watch TV, limit how late child can stay out with friends, maintaining a minimum grade point average, doing homework, doing chores, and/or if the parent(s) help(s) with homework; this variable tests the importance of parental inputs in the lives of maturing children in the children's ability or preference in avoiding at-risk behaviors. **ITEMS** = a composite variable containing normalized scores for whether the following educationally facilitative items exist in the home: an encyclopedia, an atlas, a dictionary, a calculator, and/or fifty or more books; **PAR_EDUC** = the average educational

attainment of the parents, or the educational attainment of the parent; **DROP_SIB** = whether a sibling of the child has dropped out of school; **MARRIED** = asks whether the parents of the child are married to one another; this is a direct test of the hypothesis that the parents being married to one another is important in reducing youth at-risk behavior. **RELIG** = whether the family observes any religious activities; this tests the hypothesis that religious activities are important in reducing youth at-risk behavior. **CULTURE** = a composite of normalized scores for whether the family attends concerts, museums and/or science exhibits; this variable tests the importance of the parents doing various activities with their children's desire or ability to avoid at-risk behaviors. **PAR_EXP** = the level of education and/or training the parent(s) expect the child to achieve; this tests the importance of parental expectations for their children in influencing children to eschew at-risk behaviors. **UNEMPLOY** = the amount of time that neither parent or the parent is unemployed; **BOTHWORK** = whether both parents work; **LFAMINC** = the natural log of the gross income of the household, which ranges from \$3,750.00 to over \$200,000.00 over ten categories, where the natural log was taken to maintain scale consistency with the other variable scores; this tests the hypothesis that money income is an important component in reducing youth at-risk behavior. **e** = an error term which includes the effects of other missing family and individual attributes.

The variables above test the hypothesis as follows. If **DADHOUSE** is statistically significant and negative, it means that increasing the time the child spends with the father reduces the likelihood that the child will be involved in the at-risk behavior being regressed; the same is true for **MOMHOUSE**. If **LFAMINC** is significant and negative

it means that increasing family money income decreases the likelihood of youth involvement in the at-risk behavior; if positive, it increases the likelihood. If RELIG is significant and negative it means that the presence of religion in the home life decreases the likelihood of youth involvement in the at-risk activity. MARRIED tests the hypothesis that parents being married to each other is important in reducing the likelihood that youth will involve themselves in at-risk behaviors. If it is significant and negative then the parents being married is important in reducing the regressed at-risk behavior for youth; if it is not, then it means single parenting is not leading to increases in youth at-risk behavior.

The same is true for the other variables of the study; if significant, negative variable values indicate that the presence of the variable reduces the likelihood of youth becoming involved in the at-risk behavior; while positive values increase this likelihood. DADHOUSE and MOMHOUSE do not test the effect of single parenting on reducing at-risk behaviors; MARRIED does.

DADHOUSE and MOMHOUSE are independent of MARRIED; they measure the importance of the respective parental inputs in reducing youth at-risk behavior, no matter what MARRIED is. Table 4.0.1 shows the family capital components represented by each model variable.

Table 4.0.0: Variable categorization into family capital forms

Family structural components	Family process components	Family human capital	Family economic capital	Family community capital
DADHOUSE				
MOMHOUSE				
	TALK_SCH			
	TLKPLAN1			
	TLKPLAN2			
MOM_ASCH				
DAD_ASCH				
	STU_PLAS			
	PAR_ATTD			
	PAR_OVER			
		ITEMS		
		PAR_EDUC		
DROP_SIB				
MARRIED				
				RELIG
	CULTURE			
		PAR_EXP		
			UNEMPLOY	
BOTHWORK				
			LFAMINC	

Having established the context for the use of the model variables the study now proceeds from an economic perspective. The discussions to follow will be oriented around the variables themselves or the at-risk behaviors.

The Question of Panel Data

It is known that where studies utilize panel data straight forward applications of qualitative model techniques, such as the probit model, create serious difficulties;

alternative models would then be called for (Hsiao 1986). The question of whether the present use of this longitudinal data qualifies as a panel data study is therefore important.

This study looks at certain background characteristics of an eighth grade cohort in cross section in one time period; it then looks at their activities *after the passage of four years* in one time period, that is, in their senior high school year. This resembles a treatment-response study, e.g., where a population sample receives an inoculation, and then later on, population responses are measured to see the effectiveness of the inoculation². Because of its construction, and the lack of any time series or longitudinal pooling of data, the present study is not a panel data study and there is no need to require the application of panel data study modeling techniques.

Multicollinearity and bias considerations

With the regressions using many dummy variables representing closely related activities the problem of near multicollinearity often exists. This can make the effect of explanatory variables on the dependent variables difficult to discern (Kennedy 1992).

² Indeed, the idea that these at risk behaviors themselves share characteristics of a contagious disease has been modeled by social scientists. According to Malcolm Gladwell, ("The Tipping Point: Why is the city so much safer—could it be that crime really is an epidemic?" *The New Yorker*, June 3, 1996) "...David Rowe, a psychologist at the University of Arizona, uses epidemic theory to explain things like rates of sexual intercourse among teenagers. ...the pattern in which they first have sex will look like an epidemic curve. Non-virginity starts out at a low level, and then, at a certain point, it spreads from the precocious to the others as if it were a virus. ...Today, bringing epidemiological techniques to bear on violence is one of the hottest ideas in criminal research. 'We've got a hundred and ten people and a budget of twenty-two million dollars [at the Center for Disease Control]. ...There is interest in this all around the world now.'"

With over 10,000 observations on each variable, multicollinearity is not a problem. Many of the variables have t-values very high in absolute value, indicating that the corresponding estimated coefficient is clearly identified.

Some of the variables suffered from having too few gradations. DADHOUSE, for example, asked the father how much time the child spends living with him; all, most, some, or none. Because there were so few responses for the "most" and "few" categories, it was necessary to collapse these cells into a dichotomous variable, with "all" and "most" being a "1" and "some" and "none" being a "0".

Some pooling of independent variables was done where there would be no loss of specification. PAR_OVER is a composite variable of TVPROGRAM + TVLATE + TVHOURS + MAINTAININGPA + HW_RULE + DOCHORS + HELP_HW + HWRK_HLP + LIM_FREN. CULTURE is a composite of CONCERTS + MUSEUMS + SCIENCE + HISTORY. ITEMS is a composite of ENCYCLO + ATLAS + DICTION + CALCULAT + BOOKS. A complete list of all background variables used is contained in the appendix. Pooling the scores for these items, such as for the educational items found in the house, such as for having an atlas, an encyclopedia, etc., or visiting museums and attending concerts, a rule for TV shows and TV watching time, etc., is appropriate since knowing the effect of having an atlas versus having a dictionary is not desired. The set of dummy variables used a two parent home where one or both parents work as the benchmark to which other possibilities are compared.

SEX_RISK, the value for sexual activity could be biased upwardly by some of the male respondents giving less than candid answers to the questions (bragging); some of the questions asked for the respondent's attitudes about having premarital or extramarital sex. However, most of the questions, as shown in the appendix, asks if the respondent was pregnant, or was a father, or asks who takes care of his or her children, etc. For questions such as these there would seem to be little reason to give a false answer.

Results of the Study

A discussion of the regression results follows an analysis of correlations and means. Table 4.0 presents a summary of descriptive statistics. For dichotomous questions, when the minimum is zero and the maximum is unity the scores can be treated as the percentage of the sample having the characteristic in question; when the scores range between other numbers they must be normalized to represent percentages. For polychotomous questions the numerical values are not readily interpretable.

Table 4.0.1: Summary statistics of the model variables

Number of Observations: 10670

Variable	Mean	Std.dev	Minimum	Maximum
DADHOUSE	0.76542	0.42376	0.00000	1.00000
MOMHOUSE	0.94799	0.22207	0.00000	1.00000
TALK_SCH	1.78201	0.46581	0.00000	2.00000
TLKPLAN1	1.36439	0.64461	0.00000	2.00000
TLKPLAN2	1.24958	0.66516	0.00000	2.00000
MOM_ASCH	0.72596	0.44605	0.00000	1.00000
DAD_ASCH	0.40347	0.49062	0.00000	1.00000
STU_PLAS	0.40525	0.49496	0.00000	1.00000
PAR_ATTD	0.67882	0.46695	0.00000	1.00000
PAR_OVER	0.66756	0.20534	0.00000	1.00000
ITEMS	4.40872	0.87533	0.00000	5.00000
PAR_EDUC	1.81715	1.13369	0.00000	1.00000
DROP_SIB	0.12174	0.51474	0.00000	6.00000
MARRIED	0.83168	0.37417	0.00000	1.00000
RELIG	0.97610	0.15274	0.00000	4.00000
CULTURE	2.02652	1.5814	0.00000	4.00000
PAR_EXP	2.09250	0.92119	0.00000	4.00000
UNEMPLOY	0.050422	0.21882	0.00000	1.00000
BOTHWORK	0.58697	0.49240	0.00000	1.00000
FAMINC	\$60285.22981	\$55777.91542	\$4892.89990	\$326193.312
DA_PROB	0.22980	0.42073	0.00000	1.00000
SEX_RISK	0.81828	0.38564	0.00000	1.00000
CRIMINAL	0.012933	0.11299	0.00000	1.00000
GANG	0.10694	0.30905	0.00000	1.00000

High correlations are expected between some of these variables. For example, the highest correlation exists between the parents being married (MARRIED) and the child living with the father (DADHOUSE), 0.63470, while the correlation between MARRIED and MOMHOUSE is only 0.18565. This means that the child living with the mother has little to do with the marital state of the child's parents; *but the child living with the father is far more dependent on the child's parents being married to one another*. Thus, there is an increased likelihood that the child will spend significant time living with his or her father if that father is presently married to the child's mother. Therefore, whatever the effect MARRIED has on the dependent variables, it is closely associated with the presence of DADHOUSE, and affects the time the father spends with the child. Nevertheless, MARRIED tests the effect single parenting has on youth at-risk behaviors, whereas DADHOUSE and MOMHOUSE do not. Children of divorced parents can live with either or both parents, depending on what arrangement has been made for them.

The parent talking to the child about high school plans, TALKPLAN1, is correlated with talking about post high school plans, TALKPLAN2, 0.60763. Parental education level, PAR_ED, is correlated with family money income BY 0.51074, and with parental expectations, PAR_EXP, 0.38920. Being married, MARRIED, is correlated with both parents working, BOTHWORK, by 0.43303.

The correlation between DADHOUSE and FAMINC³ is 0.22792, while for MOMHOUSE and FAMINC is 0.037758. The higher level of correlation between DADHOUSE and FAMINC reflects the generally larger earning power of the father compared with that of the mother. This correlation says that when the father leaves the household there is greater chance that family money income will be significantly reduced than when the mother leaves, due to the difference in their earning powers.

MARRIED and BOTHWORK are correlated at 0.43303. This association reflects the economic reality that in many families with parents who are married to each other, both parents must work.

DADHOUSE having a mean of 0.76542 means that, of the children in this survey, they spent an average of 76.542% of their living time with their fathers, whether also with their mothers or not; and for MOMHOUSE, 94.799% of the time the children spent with their mothers, whether their fathers were also present or not. Of the children surveyed, 66.756% had parental oversight in their lives as the variable is defined above. Over 83% of the children had parents married to one another and over 97% indicated that religious observances of some kind existed in their homes.

SEX_RISK, the mean value for this twelfth grade cohort being sexually active was 81.828%, DA_PROB, of having a drug and/or alcohol problem, was almost 23%, CRIMINAL, being criminally active, less than 2%, and GANG, belonging to a street gang or exhibiting anti-social behavior, 10.69%. Thus, most of the twelfth graders

³ For the correlation table, as for the mean table, family income was used, not its natural log. The natural log of family income was used for the regressions to keep income within the same exponential scale as the other variable values.

surveyed were sexually active and about one fourth had a drug and/or alcohol problem. The value for the youth having a drug and/or alcohol problem is based on responses to questions such as whether the respondent engages in binge drinking regularly, whether s/he is in a drug and or alcohol rehabilitation program or has been counseled to enter one, etc., whether the respondent has been expelled from school for drinking or taking drugs, etc.

Of note are the small percentage of responses for criminality, CRIMINAL, and GANG, gang and anti-social behavior. Even while the percentages are very small, it is felt that, with so many observations, the probit process can still do an adequate job of regressing these at-risk behaviors on the independent variables.

The first probit model regressed the likelihood of having a drug and/or alcohol problem on the full set of background characteristics. The results are shown in Tables 4.1a-b.

Table 4.1.0: Probit for the probability of having a drug and/or alcohol problem

NUMBER OF OBSERVATIONS = 10670

NUMBER OF POSITIVE OBSERVATIONS = 2452

PERCENT CORRECT PREDICTIONS = 77.0197

Variable	likelihood estimate	t-statistic
DADHOUSE	-0.108766	-2.60287
MOMHOUSE	-0.094082	-1.49337
TALK_SCH	-0.022862	-0.670407
TLKPLAN1	0.034954	1.26453
TLKPLAN2	-.000301324	-0.114616
MOM_ASCH	-0.00293882	-0.090670
DAD_ASCH	0.020424	0.693939
STU_PLAS	0.00660796	0.233150
PAR_ATTD	-0.021197	-0.697743
PAR_OVER	-0.237076	-3.32257
ITEMS	0.040115	2.38342
PAR_EDUC	-0.050937	-3.14201
DROP_SIB	0.071170	2.73539
MARRIED	-0.151452	-2.83647
RELIG	-0.174329	-2.03269
CULTURE	-0.028318	-2.70533
PAR_EXP	-0.116192	-6.84399
UNEMPLOY	0.046550	0.675338
BOTHWORK	0.071054	2.18865
LFAMINC	0.168750	7.43170

Table 4.1.1: Mean effect of the significant variables at the mean for youth having a drug and/or alcohol problem

Variable	%ch. in likelihood of behavior
DADHOUSE	-0.032355
PAR_OVER	-0.070525
ITEMS	0.011933
PAR_EDUC	-0.015152
DROP_SIB	0.021171
MARRIED	-0.045053
RELIG	-0.051859
CULTURE	-0.0084240
PAR_EXP	-0.034564
BOTHWORK	0.021137
LFAMINC	0.050199

The overall model goodness-of-fit test for the probit estimation is not given by R-squared or adjusted R-squared values, which are typically minuscule, but by the percentage of correct predictions versus all the predictions. The value of 77.0197 indicates a good overall fit.

The entries in Table 4.1b, the "Mean effect for having a drug and/or alcohol problem at the mean of the significant explanatory variables," are understood as follows. The entry for PAR_OVER is -0.070525. This says that if parental oversight increases by ten percent over its mean value there would be a decrease in the likelihood of having a drug and/or alcohol problem by about 7 percentage points. The likelihood of having a drug and/or alcohol problem is reduced slightly more if the child lives with the father,

DADHOUSE, (-3.2 percentage points) than if the child lives at home with the mother, MOMHOUSE, (-2.7 percentage points), *ceteris paribus*. The marriage variable, MARRIAGE, has the fourth largest effect; for a ten percent increase in the parents being married there is a decrease in the likelihood of the child having a drug and/or alcohol problem by five percentage points. This supports the hypothesis that increasing single parent families leads to increasing the likelihood that youth will have a drug and alcohol problem. PAR_OVER, DADHOUSE, MOMHOUSE and MARRIAGE test the hypothesis that these family background characteristics are important in reducing youth at-risk behaviors; the data show that the null that these variables have no effect is rejected at the 95 % confidence level.

LFAMINC, on the other hand, tests the hypothesis that increasing family income has a positive effect on reducing the likelihood of youth at-risk behaviors. This is rejected: increasing family income, LFAMINC rising, *increases* the likelihood that youth will have a drug and/or alcohol problem.

If the child has a sibling that dropped out of school, DROP_SIB, the likelihood that the child will use drugs increases slightly. An increase in the mean level of religious activity in a household, RELIG, by 10 percent reduces the chance of having a drug and/or alcohol problem by 5 percentage points.

The data and methodology of this study has allowed family money income to be segregated from other family background characteristics normally aggregated with family income, such as employment, parental educational levels, cultural activities, home environment, parental inputs in the child's life, religious observances, etc. Other studies

cited in the literature search either did not, or could not, disaggregate family money income from these other variables. Without disaggregating family money income from other family and home variables, it might logically be concluded that low family income leads to a worsening outlook for children, as indeed much of the cited literature has concluded. But this study shows that increasing family money income does not, in and of itself, reduce the likelihood that children will develop a drug and/or alcohol problem; in fact, quite the opposite was found to be true. This model implies that if parents spend their money on educational items, and have high educational expectations for their children, and spend more time with them in school activities, their children's at-risk behavior will be reduced.

The probit results of regressing being sexually active on the full set of explanatory variables are shown in Tables 4.2a-b.

Table 4.2.0: Probit for the probability of being sexually active

NUMBER OF OBSERVATIONS = 10670

NUMBER OF POSITIVE OBSERVATIONS = 8731

PERCENT CORRECT PREDICTIONS = 81.8276

Variable	Likelihood estimate	t-statistic
DADHOUSE	-0.293295	-6.02981
MOMHOUSE	-0.154752	-2.12746
TALK_SCH	-0.00724455	-0.200189
TLKPLAN1	0.076952	2.63197
TLKPLAN2	0.023922	0.857915
MOM_ASCH	-0.086938	-2.44259
DAD_ASCH	-0.00364037	-0.117636
STU_PLAS	-0.55100	-1.85176
PAR_ATTDD	-0.18663	-0.575470
PAR_OVER	-0.545324	-7.08806
ITEMS	0.0325599	1.81490
PAR_EDUC	-0.054119	-3.24329
DROP_SIB	0.088904	2.7668
MARRIED	-0.157568	-2.57645
RELIG	-0.237340	-2.7109
CULTURE	-0.016545	-1.49077
PAR_EXP	-0.037767	-2.17695
UNEMPLOY	0.059690	0.810667
BOTHWORK	0.142480	4.26921
LFAMINC	0.108532	4.53519

Table 4.2.1: Mean effect of the significant explanatory variables
at the mean of youth being sexually active

Variable	%ch. in likelihood of behavior
DADHOUSE	-0.075456
MOMHOUSE	-0.039813
TLKPLAN1	0.019798
MOM_ASCH	-0.022366
PAR_OVER	-0.14030
PAR_EDUC	-0.013923
DROP_SIB	0.022872
MARRIED	-0.040538
RELIG	-0.061060
PAR_EXP	-0.0097164
BOTHWORK	0.036656
LFAMINC	0.027922

Notice the strong effect parental oversight, PAR_OVER, has on the likelihood of being sexually active: For a 10 percent increase in this mean value the likelihood that the child will be sexually active drops by almost 14 percentage points; it was also the most significant variable, with a T-statistic of -7.08806 at the 95% level of confidence. When a child lives with either a father, DADHOUSE, or a mother, MOMHOUSE, each is important in reducing this likelihood; living with one's father is slightly more so, 7 percentage points versus 3.9 percentage points respectively. The child living with the father is also more highly significant, with t-statistic values of -6.029 versus -2.127 respectively. Increasing religious activity over its mean value by 10 percent reduces the

likelihood of being sexually active by about 6 percentage points, the third largest effect overall. Parents being married to each other, MARRIED, is statistically significant and also negatively affects this likelihood by 4 percentage points, the fourth largest effect overall.

The results of regressing being criminally active on the full set of explanatory variables are contained in Tables 4.3a-b.

Table 4.3.0: Probit for the probability of being criminally active

NUMBER OF OBSERVATIONS = 10670

NUMBER OF POSITIVE OBSERVATIONS = 138

PERCENT CORRECT PREDICTIONS = 98.7067

Variable	Estimate	t-statistic
DADHOUSE	0.040248	0.403238
MOMHOUSE	-0.335618	-2.84490
TALK_SCH	-0.045569	-0.568149
TLKPLAN1	-0.0054311	-0.079569
TLKPLAN2	0.055951	0.832255
MOM_ASCH	-0.126957	-1.61105
DAD_ASCH	0.135751	1.83314
STU_PLAS	0.205137	2.89780
PAR_ATTDD	-0.194750	-2.66386
PAR_OVER	-0.378296	-2.11677
ITEMS	-0.00374252	-0.097570
PAR_EDUC	-0.052924	-1.26082
DROP_SIB	0.027908	0.487212
MARRIED	-0.146479	-1.20048
RELIG	-0.119248	-0.619519
CULTURE	0.013824	0.522650
PAR_EXP	-0.194335	-4.12913
UNEMPLOY	0.015470	0.099409
BOTHWORK	-0.000314557	-0.00372749
LFAMINC	0.022661	0.401193

Table 4.3.1: Mean effect of the significant variables at the mean for youth being criminally active

Variable	%ch. in likelihood of behavior
MOMHOUSE	-1.010552
STU_PLAS	0.0064498
PAR_ATTDD	-0.0061232
PAR_OVER	-0.011894
PAR_EXP	-0.0061101

Few of the variables are statistically significant, even while the overall model fit achieves an almost perfect score of 98.7016 percent correct predictions. Few of the survey participants are criminally active; 138 out of 10,670 participants. This means that the variables have too much randomness to be statistically significant.

The effect the significant variables have on the probability of becoming criminally active, however, is negligible. For a 10 percent increase in parental oversight there is a 1 percentage point decrease in the probability of becoming criminality active. The effect of a change in family income on becoming criminally active is noteworthy in its lack of having any strong effect; a ten percent increase in its mean value increases the likelihood of becoming criminally active by 0.0712 percentage points, or practically not at all. MARRIAGE is not significant in this model, nor is the child living with the father, DADHOUSE. The correlation between the two variables is 0.63470, meaning that there is a fair likelihood that when the parents are married the father is present in the child's life, and where there is a divorce or separation this likelihood decreases.

Parental expectations, PAR_EXP, are significant, and reduce the likelihood slightly. Family money income, LFAMINC, is not a significant variable in this model.

The results for regressing youth gang and anti-social behavior on the explanatory variables are shown in Tables 4.4a-b.

Table 4.4.0: Probit for the probability of being in a youth street gang or exhibiting anti-social behavior

NUMBER OF OBSERVATIONS = 10670
 NUMBER OF POSITIVE OBSERVATIONS = 1141
 PERCENT CORRECT PREDICTIONS = 89.3158

Variable	Likelihood estimate	t-statistic
DADHOUSE	-0.212448	-4.38072
MOMHOUSE	-0.260846	-3.73420
TALK_SCH	-0.102389	-2.57791
TLKPLAN1	-0.069976	-2.07309
TLKPLAN2	0.033486	1.03462
MOM_ASCH	-0.033238	-0.830875
DAD_ASCH	-0.023875	-0.65032
STU_PLAS	0.077638	2.21762
PAR_ATTD	-0.193213	-5.33263
PAR_OVER	-0.113762	-1.27658
ITEMS	-0.00331631	-0.170385
PAR_EDUC	-0.065823	-3.21046
DROP_SIB	0.089414	3.16816
MARRIED	0.032511	0.520527
RELIG	-0.094075	-0.925702
CULTURE	0.017610	1.34888
PAR_EXP	-0.1156537	-7.28817
UNEMPLOY	0.1347478	1.83173
BOTHWORK	0.00750346	0.184343
LFAMINC	-0.024938	-0.907363

Table 4.4.1: Mean effect of the significant explanatory variables at the mean for youth being in a youth gang or exhibiting anti-social behavior

Variable	%ch. in likelihood of behavior
DADHOUSE	-0.036825
MOMHOUSE	-0.045214
TALK_SCH	-0.017748
TLKPLAN1	-0.012129
STU_PLAS	0.013457
PAR_ATTD	-0.033491
PAR_EDUC	-0.011410
DROP_SIB	0.015499

Again, there is a good overall model fit of the model and the data, 89.31% correct predictions, but few of the explanatory variables are statistically significant. A reduction in the likelihood of exhibiting youth gang or anti-social behavior of 4.5 percentage points is possible for a 10 percent increase in the mean value of the time the mother lives with the child, and there is a 4.6 percentage point increase in this likelihood when the school has occasion to contact the parents 10 percent more often than the mean value for this variable. DROP_SIB is significant and slightly increases the likelihood for this behavior.

Family income is again notable for its lack of significance on the probability of being in a youth gang or exhibiting anti-social behavior; being a religious household was not significant; marriage of the parents was not significant either. DADHOUSE and MOMHOUSE were significant in reducing street gang participation and anti-social

behavior. The literature cited makes the point that gangs often act as surrogate families for youth. If this is true then the presence of a father and/or a mother in the child's life should reduce gang involvement; the data show this to be the case. MARRIAGE is not significant in reducing this at-risk behavior by youth and has no effect on it. For this behavior the parents being married is not as important to youth as having near access to the parents, as measured by DADHOUSE and MOMHOUSE.

It has been hypothesized that increases in the family background variables of MARRIAGE, DADHOUSE, MOMHOUSE, LFAMINC, PAR_OVER, PAR_EXP, PAR_ED, and some other variables, are significant in reducing at-risk behaviors by youth. The results will be organized around the specific at-risk behaviors targeted in the model. Tables 4.5a-d summarize the results of the hypothesis tests.

Table 4.5.0: Hypotheses tests for youth drug and/or alcohol use

The variable hypothesized as being important in reducing youth drug and/or alcohol use	The variable's effect on reducing the behavior, listed by descending order of importance
PAR_OVER	Reduces it
RELIG	Reduces it
MARRIED	Reduces it
PAR_EXP	Reduces it
DADHOUSE	Reduces it
LFAMINC	Increases it
DROP_SIB	Increases it
BOTHWORK	Increases it
UNEMPLOY	Increases it

Regarding drug and/or alcohol problems, increasing the father/child association (DADHOUSE increasing) increasing parental oversight (PAR_OVER increasing), having the parents are married to one another (MARRIAGE increasing), increasing religious activity in the home (RELIG increasing), and increasing parental academic expectations for their child (PAR_EXP increasing), all reduced the likelihood that youth will have a drug and/or alcohol problem. It had also been hypothesized that the mother/child association would be important in reducing this behavior; it was not found to be significant.

Table 4.5.1: Hypotheses tests for youth sexual activity

The variable hypothesized as being important in reducing youth sexual activity	The variable's effect on reducing the behavior, listed by descending order of importance
PAR_OVER	Reduces it
DADHOUSE	Reduces it
RELIG	Reduces it
MARRIED	Reduces it
MOMHOUSE	Reduces it
MOM_ASCH	Reduces it
PAR_EDUC	Reduces it
PAR_EXP	Reduces it
BOTHWORK	Increases it
LFAMINC	Increases it

Increasing parental oversight, mother/child and father/child associations, increasing religious activity in the home, the parents being married to one another, were all found to reduce the likelihood that youth will become sexually active, with other variables also having some effect. Both parents working and increasing family income increased this likelihood.

Table 4.5.2: Hypotheses tests for youth criminal activity

The variable hypothesized as being important in reducing youth criminal activity	The variable's effect on reducing the behavior, listed by descending order of importance
PAR_OVER	Reduces it
MOMHOUSE	Reduces it
STU_PLAS	Reduces it
PAR_ATTD	Reduces it
PAR_EXP	Reduces it
RELIG	No effect
DADHOUSE	No effect
MARRIED	No effect

Increasing parental oversight, the mother/child association, and parental academic expectations all reduced the likelihood of youth criminal activity. Increasing the number of times parents attend school activities involving the child and the child having his/her own place to study also decreased this behavior. The variables of religious activity, the father/child association, and the parents being married to one another were hypothesized

to be significant; in reducing youth criminal activity they were not. This means, among other things, that single parenting does not increase youth criminal activity.

Table 4.5.3: Hypotheses tests for youth street gang participation and anti-social behavior

The variable hypothesized as being important in reducing youth gang participation and anti-social behavior	The variable's effect on reducing the behavior, listed by descending order of importance
MOMHOUSE	Reduces it
DADHOUSE	Reduces it
PAR_ATTD	Reduces it
TALK_SCH	Reduces it
TLKPLAN1	Reduces it
PAR_EDUC	Reduces it
DROP_SIB	Increases it
STU_PLAS	Increases it
RELIG	No effect
MARRIED	No effect

Increasing the mother/child association, the father/child association, the parents attending more school activities involving the child, Increasing the educational attainments of the parents, and talking to the child about high school plans were all found to reduce youth street gang participation and anti-social behavior. A sibling of the child dropping out of school and the student having a place to study increases this behavior. It had been hypothesized that parental oversight would be important in reducing this

behavior; it was found to be insignificant in reducing this behavior. Again, single parenting has not been shown to increase this at-risk behavior.

Discussion

There is a natural tendency to expect the independent variables to account for much of the observed variance reflected in the data when overall model fit is good and the variables are significant. This is unjustified when modeling human behavior because of the inherent seeming randomness in what humans do and why they do it. So little is actually known about why we act the way we do that it is gratifying for a model to explain even five percent of the variance in outcomes. The models presented here are in accord with this reality.

As shown in tables 4.5a-d, PAR_OVER was significant in reducing at-risk behaviors three out of four times, as was DADHOUSE. All other variables were significant in reducing at-risk behaviors no more than two out of four times. Being in a family with married parents was significant in reducing two of the four at-risk behaviors, those of having a drug and/or alcohol problem and being sexually active. The parents being married to one another and increasing the father/child association were significant for the at-risk behaviors; the effect of these variables on reducing the likelihood of the child having a drug and/or alcohol problem or of being sexually active is 7.7 and 11.5 percentage points respectively. Single parents face a variety of challenges according to the cited literature. While the challenges are real, this study found mixed results to support the hypothesis that single parenting increased the

likelihood that youth will become involved in at-risk behaviors. It increased drug and/or alcohol abuse and sexual activity; it did not increase criminal activity or youth participation in street gangs or anti-social behavior.

The greatest effect of any of the variables on the left hand side probabilities was a drop of 14 percentage points in the likelihood of becoming sexually active where parental oversight is increased over its mean value by 10 percent. Parental oversight is significant in three of the four models. Religious activity in the home also reduced this likelihood by 6.1 percentage points when its mean value was increased 10 percent. Religion also reduced the likelihood of having a drug and/or alcohol problem by five percentage points when its mean was increased by 10 percent. But the variable having the greatest effect on the likelihood of having a drug and/or alcohol problem was again parental oversight, which reduced it by seven percentage points for a ten percent increase in its mean value.

Youth criminality is not well modeled by this set of independent variables. The model of youth gang activity and anti-social behavior likelihood had more significant variables than for the criminal activity likelihood model, according to t-test scores at the .95 level of confidence, even while their influence on this likelihood was lower than the significant variables for the sexual activity or the drug and/or alcohol problem likelihood models. This is quite surprising considering how little is known about this topic. Parental educational expectations for the child, the parents living in the home and the parents attending school events all reduced the likelihood of youth gang activity and anti-social behavior.

The Income Effect

A common assumption in social science is that income is very important in determining outcomes for children as they grow up, and thereby in the nature of the decisions they make in life. The literature cited above emphasize this. These model results contradict this commonly-held hypothesis and show that other variables are more important. Obviously, the more money the family has at its disposal, the easier it is to obtain educational items for learning both at home, at school and in their leisure activities. It also might be important in whether youth engages in at-risk behavior. Consider a circumstance where, because of family poverty, the youth must live in a neighborhood where drugs are sold in public, where many associates or known individuals are in jail or awaiting trial, where others have children but are not married, where some are in gangs, where associates have been expelled or transferred, and where few go to school beyond the minimum required age. Such an environment would make acquiring drugs easy, and would be expected to affect the youth's world view concerning the taking of drugs for recreation. At the other extreme, a youth from a very wealthy family, surrounded by the best material environment money can buy, might find that the ordinary rules that apply to everyone else do not apply to him, and that drugs are relatively cheap, thus making the use of drugs viable for him.

To test this, the four probit regressions were rerun using three different family income levels selected from the survey; a low income group earning \$20,00.00 or less, a middle income group earning between \$20,001.00 and \$74,999.00, and a high income group earning \$75,000.00 or more. The results shown in the following tables follow the

same format as those above. A summary discussion follows the individual analyses for each income level model set.

Summary descriptive statistics for the income groups are shown in table 4.6.

Table 4.6: Summary statistics for the income groups

Variable (sample size)	Low income mean sample (1572)	Middle income mean sample (6142)	High income mean sample (2956)	Range
DADHOUSE	0.46183	0.77646	0.90392	0-1
MOMHOUSE	0.92939	0.94725	0.95940	0-1
TALK_SCH	1.59160	1.77971	1.88802	0-1
TLKPLAN1	1.25827	1.35005	1.45061	0-2
TLKPLAN2	1.11132	1.24666	1.32916	0-2
MOM_ASCH	0.92939	0.94725	0.95940	0-1
DAD_ASCH	0.39631	0.44839	0.31394	0-1
STU_PLAS	0.35878	0.37626	0.95040	0-1
PAR_ATTD	0.49491	0.68268	0.76861	0-1
PAR_OVER	0.64681	0.67376	0.66573	0-1
ITEMS	3.84987	4.42055	4.68133	0-1
PAR_EDUC	0.95229	1.59557	2.73748	0-4
DROP_SIB	0.31997	0.11309	0.039919	0-4
MARRIED	0.49936	0.85754	0.95467	0-1
RELIG	0.49491	0.97932	0.98241	0-1
CULTURE	1.16539	1.89075	2.76658	0-4
PAR_EXP	1.75891	0.11309	2.48512	0-4
UNEMPLOY	0.25127	0.01970	0.0074425	0-1
BOTHWORK	0.22774	0.62423	0.70061	0-1
FAMINC	\$11,329.615	\$41,930.338	\$124,457.749	\$4,892.89- \$326,193.31
DRUG/ALC	0.22201	0.22094	0.25237	0-1
SEX_RISK	0.82824	0.81488	0.82003	0-1
CRIMINAL	0.019084	0.013351	0.0087957	0-1
GANG	0.16730	0.10257	0.083897	0-1

The average family income for the low income group is below the poverty line; the poverty level for a family of four, head of household under 65 years old, is \$12,092 in 1988, the year these background data were gathered (U.S. Bureau of the Census, Current Population Reports, 1989). This would put the mean of this low income group with earnings of \$11,329 below the poverty threshold level. For a family of three the threshold poverty level drops to \$9,435, so these families in the low income would not be officially in poverty.

The time the child spends living with the father, DADHOUSE, has fallen from a mean of 0.76542 for the entire survey group to 0.46183 for the low income group. This means that it is generally the case that children in this group spend less time with their fathers. MARRIED had a mean of 0.83168 for the entire survey group, but only 0.49936 for the low income group. This suggests that low income families have lower marriage levels than that for the entire survey group. Recall that MARRIED and DADHOUSE had a correlation coefficient of 0.63470, which is not high enough to prevent estimation of the variables given a sufficiently large sample, but noteworthy in that it shows the degree of linear association between a family being comprised of two parents married to one another and the presence of a father in the lives of their children. That there are fewer married parent families in the lower income group indicates that, *ceteris paribus*, children will have less to do with their fathers, reducing this influence in their lives.

The mean income level for the middle income group is \$41,930.00, with a minimum of \$22,833.00 and a maximum of \$55,452.00. The mean for DADHOUSE

has jumped from 0.46183 to 0.77646; MARRIED has increased from 0.49936 to 0.85754. DADHOUSE and MARRIED are correlated at 0.56173; this is a reduction compared with the low income group which is correlated at 0.74891. This means that for the middle income group a divorce or separation is less likely to result in the father losing contact with his children, as is more often the case for the low income group. That DADHOUSE and MARRIED are both lower for the low income group than for the middle income group reflects the association stated in the cited literature between low incomes and single parent households; if the household is comprised of two parents then it decreases the likelihood that it will be a poor household.

Even while other explanations are possible, if the speculation offered above as to why DADHOUSE is insignificant in the low income regression sets is correct, then DADHOUSE is predicted to be more often significant in the middle and high income groups, *ceteris paribus*, and assuming that the critical value has been achieved.

Compared to the middle income group, for the high income group MARRIED has increased from 0.78455 to 0.95467; DADHOUSE has risen from 0.71234 to 0.90392. Whether being a two parent family leads to greater economic prosperity or greater economic prosperity makes it easier for parents to remain together, there is a positive association between increased money income and two parent families, and with the time children spend with their fathers. The variance for DADHOUSE and MARRIED has also diminished from 0.45270 and 0.41116 respectively for the middle income group to 0.29474 and 0.20807 respectively for the high income group. The mean value for BOTHWORK for this income group is a normalized 0.70, while for the middle income

level it is 0.54, and for the low income group it is 0.22. Unemployment for the low income group is over 25%, 1.9% for the middle income group, and 0.07%, or almost nonexistent for the high income group. As a modeled variable in the high income group, it drops out entirely from consideration.

The following table shows whether the differences in youth at-risk behavior between family income groups is significant.

Table 4.7 : Significance tests of youth at-risk behaviors for difference between means

At-risk behavior	Low to middle income group mean test	Middle to high income group mean test	Low to high income group mean test
Drug and/or alcohol use	No difference	Significant difference	Significant difference
Sexual activity	No difference	No difference	No difference
Criminal activity	Significant difference	No difference	Significant difference
Gang and anti-soc. activity	Significant difference	Significant difference	Significant difference

The mean value for the likelihood of having a drug and/or alcohol problem for the middle income youth is 0.22094; this compares with a mean value of 0.22201 for the low income group. A test of the significance at the 95% confidence level between these two means concluded that the null hypothesis that there is no difference cannot be rejected. The mean value for the high income youth having a drug and/or alcohol problem is 0.25237; this compares with 0.22094 for the middle income group. A test at the 95% confidence level of the significance of the difference between the two means rejected the null hypothesis that there is no difference, and concluded that the mean difference is significant. A further test of the significance of the difference between the

means for low income and high income youth also rejected the null hypothesis at the 95% confidence level that there is no difference. Therefore, increasing family income *increased* the likelihood that youth will have a drug and/or alcohol problem.

The mean for the likelihood that middle income youth will be sexually active is 0.81488; this compares with 0.82824 for the low income group. A significance test of the null hypothesis that their difference is significant failed to reject the null that no difference exists at the 95% confidence level. This again indicates that money income is not significant in affecting youth sexual practices, as also shown by the lack of significance for LFAMINC.

The mean value for high income youth becoming sexually active is 0.82003; this compares with 0.81488 for the middle income group. A test at the 95% confidence level of the significance of the difference between the two means failed to reject the null hypothesis that there is no significant difference. A further test of the significance of the difference between the low and high income means also failed to reject the null hypothesis that there is no difference. This emphasizes the insignificance of changes in money income in affecting youth sexual behavior.

The mean for the likelihood that middle income youth will become criminally active is 0.01335; this compares with 0.019084 for the low income group. A test at the 95% confidence level of the null hypothesis that the difference between the two means is significant rejected this and concluded that the two means are significantly different.

The mean value for high income youth being criminally active is 0.0087957; this compares with 0.013351 for the middle income group. The test at the 95% confidence

level that the difference between the two means is significant failed to reject the null hypothesis that a significant difference exists. A further test of the significance of the difference between the low and high income means did reject the null that there is no difference. Therefore, increasing income from low to high reduces the likelihood of youth criminal activity, *ceteris paribus*. Therefore, increasing income levels from low to middle has a significant effect in reducing the likelihood that youth will become criminally active, while further increases in family money income have no significant effect.

The mean value for middle income youth being involved in a youth street gang or are exhibiting anti-social behavior is 0.10257; the mean for the low income group is 0.16730. A test at the 95% confidence level of the significance between the two means rejected the null hypothesis that there is no difference; so the hypothesis that there is a significant difference is not rejected. Increasing family money income from low income to middle income has a significant effect in reducing the likelihood that youth will belong to a street gang or exhibit anti-social behavior, *ceteris paribus*.

The mean value for the likelihood that high income youth will belong to a youth street gang or exhibit anti-social behavior is 0.083897; this compares with 0.10257 for the middle income group. A test at the 95% confidence level that the difference between these means is significant rejected the null that the difference is not significant. A similar test between low and high income means also showed that the difference is significant. Therefore, increasing income from middle to high or low to high for youth

reduces the chances that youth will belong to a street gang or exhibit anti-social behavior, *ceteris paribus*.

Except for the likelihood that youth will become sexually active, criminal and youth gang and anti-social behavior likelihoods have declined with increases in family money income, while the drug and/or alcohol problem likelihood has risen. Thus, having more money facilitates youth having a drug and/or alcohol problem, *ceteris paribus*. The youth sexual activity value being approximately the same for all income groups indicates that money income has no significant effect on this outcome.

The discussion which follows of the effect income has in youth at-risk behavior with respect to the individual effects of each variable is oriented around each at-risk behavior. Table 4.8a-b begins the income comparison with the probit results for youth drug and/or alcohol problems. The sample sizes were given in table 4.6 above, and remain unchanged throughout.

Table 4.8.0: Probit for the probability of youth having a drug and/or alcohol problem

Variable	Estimate and t-statistic: low income group 77.86% correct predictions		Estimate and t-statistic: middle income group 77.90% correct predictions		Estimate and t-statistic: high income group 74.72% correct predictions	
DADHOUSE [t-statistic]	-0.188440	[-1.67360]	-0.104672	[-1.99936]	-0.090927	[-0.971630]
MOMHOUSE [t-statistic]	0.078098	[0.527140]	-0.117111	[-1.41499]	-0.175931	[-1.28573]
TALK_SCH [t-statistic]	-0.018317	[-0.244121]	-0.014517	[-0.324032]	-0.021507	[-0.268139]
TLKPLAN1 [t-statistic]	-0.00201442	[-0.029305]	0.052171	[1.38848]	0.010975	[0.210918]
TLKPLAN2 [t-statistic]	0.036446	[0.569162]	-0.0050978	[-0.143051]	-0.00331616	[-0.065803]
MOM_ASCH [t-statistic]	0.086935	[0.913374]	-0.073610	[-1.74266]	0.069871	[1.11427]
DAD_ASCH [t-statistic]	0.123594	[1.33701]	0.039561	[1.03627]	-0.048847	[-0.865760]
STU_PLAS [t-statistic]	-0.016525	[-0.201063]	0.00232724	[0.061122]	0.0075961	[0.144577]
PAR_ATTD [t-statistic]	-0.062402	[-0.821975]	-0.013224	[-0.331111]	-0.012929	[-0.211252]
PAR_OVER [t-statistic]	-0.377532	[-2.01063]	-0.252002	[-2.60888]	-0.102519	[-0.780703]
ITEMS [t-statistic]	0.141266	[4.19033]	0.017648	[0.789784]	-0.00960672	[-0.229201]
PAR_EDUC [t-statistic]	0.016834	[0.302236]	-0.060970	[-2.71601]	-0.089460	[-3.14602]
DROP_SIB [t-statistic]	0.051821	[1.26685]	0.074171	[2.01424]	0.076094	[0.785414]
MARRIED [t-statistic]	-0.139785	[-1.14022]	-0.101485	[-1.43669]	-0.300782	[-2.19887]
RELIG [t-statistic]	-0.393742	[-2.51112]	-0.032143	[-0.25560]	-0.09175	[-0.474421]
CULTURE [t-statistic]	-0.026405	[-0.883114]	-0.034763	[-2.54753]	-0.016903	[-0.845968]
PAR_EXP [t-statistic]	-0.204735	[-4.42376]	-0.130393	[-5.72714]	-0.046622	[-1.47364]
UNEMPLOY [t-statistic]	-0.043395	[-0.456753]	0.090285	[0.69304]	No unemployment	
BOTHWORK [t-statistic]	0.144812	[1.48366]	0.084717	[1.95461]	0.076310	[1.23807]
LFAMINC [t-statistic]	0.059235	[0.776821]	0.119307	[1.84257]	0.284111	[4.52916]

Table 4.8.1: mean effect of the explanatory variables at the
mean of having a drug and/or alcohol problem

Variable	%change in likelihood of behavior: low income	%change in likelihood of behavior: middle income	%change in likelihood of behavior: high income
DADHOUSE	Not significant	-0.030442	Not significant
MOMHOUSE	Not significant	Not significant	Not significant
TALK_SCH	Not significant	Not significant	Not significant
TLKPLAN1	Not significant	Not significant	Not significant
TLKPLAN2	Not significant	Not significant	Not significant
MOM_ASCH	Not significant	Not significant	Not significant
DAD_ASCH	Not significant	Not significant	Not significant
STU_PLAS	Not significant	Not significant	Not significant
PAR_ATTD	Not significant	Not significant	Not significant
PAR_OVER	-0.10714	-0.073289	Not significant
ITEMS	0.040089	Not significant	Not significant
PAR_EDUC	Not significant	-0.017732	-0.027834
DROP_SIB	Not significant	0.021571	Not significant
MARRIED	Not significant	Not significant	-0.093583
RELIG	-0.11174	Not significant	Not significant
CULTURE	Not significant	-0.010110	Not significant
PAR_EXP	-0.058101	-0.037922	Not significant
UNEMPLOY	Not significant	Not significant	No unemployment
BOTHWORK	Not significant	Not significant	Not significant
LFAMINC	Not significant	Not significant	0.088396

The model fit values are almost identical to those for the full survey sample. This will be true for all the at-risk behaviors modeled using the samples separated by income; it says that reducing the sample size has not hurt the probit's ability to correctly associate the independent variables to the respective at-risk behaviors.

For the low income group religion exercises the strongest effect in reducing this at-risk behavior: a ten percent increase in family religious activity results in a reduction

in the probability of youth having a drug and/or alcohol problem of over 11 percentage points; increasing parental oversight by ten percent reduces this likelihood by just over ten percentage points; a ten percent rise in parental expectations reduces this likelihood by almost six percentage points. DADHOUSE and MOMHOUSE are not significant here.

MARRIAGE is not significant here. This does not support the cited literature that single parenting is a problem in increasing at-risk behaviors by youth; rather, it is the lack of parental academic expectations for their children, the lack of educational items in the household, the lack of parental oversight (which is admittedly difficult for single parents to accomplish), and the lack of religious experiences in the household, increases youth at-risk behaviors. The presence of educational items in the house can give a strong signal which, combined with parental academic expectations, can influence children to choose productive paths, as the model shows.

For the middle income group DADHOUSE is now significant, as was predicted by the threshold discussion above. That discussion argued that when the father lives with the child more than some (unknown) threshold amount of time his influence will begin to make a difference on reducing this youth at-risk behavior. The correlation information shows an increase in the mean of DADHOUSE, and DADHOUSE is now significant.

Parental oversight shows the strongest reducing effect on the likelihood that youth will exhibit a drug and/or alcohol problem. Living with the father, parental expectations for their child, increased educational attainments for the parents, and parental involvement with the child in various activities such as museum and concert visits,

CULTURE, also reduce this likelihood. RELIG, which was significant and very influential in reducing the likelihood of youth having a drug and/or alcohol problem for the low income group, is not significant here. The reason may be that for the middle income group, other variables play a larger role in the youths' lives. Parental oversight, PAR_OVER, is slightly less important for this group than for the low income group, as is PAR_EXP. DROP_SIB, which measures the sibling influence over the actions of the child, is significant in slightly increasing this likelihood.

For the high income group only four variables are statistically significant. DADHOUSE is now not significant; the father might be working more hours and taking more business trips, leaving him less time to spend with his children and thus reducing his influence in their lives, even though the children live with him an average of 90% of the time. MARRIAGE has the strongest effect in reducing the likelihood of youth having a drug and/or alcohol problem. A ten percent increase in parents being married to each other reduces the likelihood of youth having a drug and/or alcohol problem by over nine percentage points. This would indicate that single parenting increases the likelihood of youth using drugs and/or alcohol, *ceteris paribus*, for upper income families, even while increasing income unambiguously increases the chances that youth will use drugs and/or alcohol.

Table 4.9.0: Probit for the probability of being sexually active

Variable	Estimate and t-statistic: low income group 82.82 % correct predictions	Estimate and t-statistic: middle income group 81.48 % correct predictions	Estimate and t-statistic: high income group 82.00 % correct predictions
DADHOUSE [t-statistic]	-0.510436 [-4.01171]	-0.255709 [-4.24216]	-0.218951 [-1.93797]
MOMHOUSE [t-statistic]	-0.100359 [-0.626864]	-0.183041 [-1.90612]	-0.168692 [-0.997970]
TALK_SCH [t-statistic]	-0.00425874 [-0.053821]	-0.02419 [-0.508957]	0.024353 [0.279485]
TLKPLAN1 [t-statistic]	0.102282 [1.39272]	0.072753 [1.86438]	0.059711 [1.05556]
TLKPLAN2 [t-statistic]	-0.027253 [-0.396640]	0.062063 [1.67635]	-0.00425754 [-0.076938]
MOM_ASCH [t-statistic]	-0.036887 [-0.354590]	-0.090310 [-1.95715]	-0.107339 [1.54674]
DAD_ASCH [t-statistic]	-0.037288 [-0.388074]	0.00335741 [0.084636]	-0.00144501 [-0.023842]
STU_PLAS [t-statistic]	-0.248033 [-3.09339]	-0.026809 [-0.679805]	-0.018308 [-0.322722]
PAR_ATTD [t-statistic]	-0.112573 [-1.38985]	0.021213 [0.503047]	-0.040120 [-0.599691]
PAR_OVER [t-statistic]	-0.114904 [-0.583225]	-0.637764 [-6.14212]	-0.593754 [-4.10432]
ITEMS [t-statistic]	0.048419 [1.36195]	0.044293 [1.86500]	-0.026564 [-0.552967]
PAR_EDUC [t-statistic]	-0.041483 [-0.740436]	-0.060111 [-2.68436]	-0.075202 [-2.44504]
DROP_SIB [t-statistic]	0.070940 [1.43810]	0.078455 [1.73540]	0.154049 [1.15749]
MARRIED [t-statistic]	0.030017 [0.223860]	-0.190282 [2.34767]	-0.138009 [-0.812918]
RELIG [t-statistic]	-0.504076 [-2.31841]	0.099352 [-0.708392]	-0.298189 [-1.21728]
CULTURE [t-statistic]	-0.013613 [-0.424834]	-0.029180 [-2.05344]	0.00820629 [0.375711]
PAR_EXP [t-statistic]	-0.022293 [-0.497962]	-0.061789 [-2.68794]	-0.00161004 [-0.047726]
UNEMPLOY [t-statistic]	-0.049704 [-0.494942]	0.97987 [0.674328]	No unemployment
BOTHWORK [t-statistic]	0.084000 [0.822781]	0.143999 [3.29190]	0.209778 [3.22455]
LFAMINC [t-statistic]	-0.00381563 [-0.047545]	0.109626 [1.62071]	0.264431 [3.75554]

Table 4.9.1: Mean effect of the explanatory variables at the mean of youth sexual activity

Variable	%change in likelihood of behavior: low income	%change in likelihood of behavior: middle income	%change in likelihood of behavior: high income
DADHOUSE	-0.122135	-0.066324	Not significant
MOMHOUSE	Not significant	Not significant	Not significant
TALK_SCH	Not significant	Not significant	Not significant
TLKPLAN1	Not significant	Not significant	Not significant
TLKPLAN2	Not significant	Not significant	Not significant
MOM_ASCH	Not significant	-0.023424	Not significant
DAD_ASCH	Not significant	Not significant	Not significant
STU_PLAS	-0.060025	Not significant	Not significant
PAR_ATTD	Not significant	Not significant	Not significant
PAR_OVER	Not significant	-0.16542	-0.15161
ITEMS	Not significant	Not significant	Not significant
PAR_EDUC	Not significant	-0.015591	-0.019202
DROP_SIB	Not significant	Not significant	Not significant
MARRIED	Not significant	-0.049354	Not significant
RELIG	-0.12199	Not significant	Not significant
CULTURE	Not significant	-0.0075686	Not significant
PAR_EXP	Not significant	-0.016026	Not significant
UNEMPLOY	Not significant	Not significant	Not significant
BOTHWORK	Not significant	0.037349	0.053564
LFAMINC	Not significant	Not significant	0.067519

For the low income group there are only three significant variables in the model. Family income is, again, not significant; but religious activity and Living with one's father have a strong effect in reducing the likelihood of youth being sexually active. Having one's own room also reduces this probability for some reason. If parents are contacting their child's school often this predicts that there is an increased likelihood that the child is sexually active.

For the middle income group the strongest effect on youth sexual activity by any of the variables is the 16 percentage point reduction in this likelihood where parental oversight is increased at the mean level by ten percent. The presence of a father is significant in reducing this likelihood, while the presence of a mother is not. The parents being married to one another also reduces this chance, as does increasing parental educational attainments, the parents taking their children to museums, concerts, etc., and parents increasing their educational expectations for their children. Both parents working slightly increases the likelihood of the child being sexually active. This might be because, with both parents working, overseeing the activities of the children becomes increasingly difficult.

Religion is not significant in reducing youth sexual activity for the middle income group, even while it is significant, and decreases the likelihood of youth sexual activity more than any other variable for the low income group. Other variables are taking the place of religion in importance for the middle income group.

For the high income group four variables are significant. The effect of a ten percent increase in parental oversight is to reduce the likelihood of youth being sexually active by over 15 percentage points. A logical explanation for this is that, at high income levels, there are more parents both working. The mean value for "BOTHWORK" for this income group is a normalized 0.70, while for the middle income level it is 0.54, and for the low income group it is 0.22. The effect of increasing this variable is to increase the chance that youth will be sexually active. This suggests that in two career households the parents have little time for overseeing what their children

are doing or for regulating their behavior. This explains the large marginal negative value for parental oversight, and the positive marginal values for both parents working, and income. DADHOUSE is just insignificant at the 95% level of acceptance, -1.94 rather than -1.96.

For the upper income group, marriage is again not significant. This means that single parenting does not increase sexual activity in upper income youth, as for the lower income group. Single parenting was significant in increasing youth sexuality only for the middle income group.

Tables 4.8a-b present the results of the youth criminal activity probit.

Table 4.10.0: Probit for the probability of being criminally active

Variable	Estimate and t-statistic: low income group 89.09 % correct predictions	Estimate and t-statistic: middle income group 98.66 % correct predictions	Estimate and t-statistic: high income group 99.12 % correct predictions
DADHOUSE [t-statistic]	0.259655 [0.980391]	0.028947 [0.231689]	0.070795 [0.259451]
MOMHOUSE [t-statistic]	-0.405320 [-1.59279]	-0.262615 [-1.61546]	-0.532309 [-1.85418]
TALK_SCH [t-statistic]	-0.287109 [-1.75698]	-0.071987 [0.649094]	0.050424 [0.195352]
TLKPLAN1 [t-statistic]	0.13881 [0.871281]	-0.00491891 [0.053491]	-0.144821 [-0.846894]
TLKPLAN2 [t-statistic]	0.093949 [0.615296]	-0.035100 [-0.398462]	0.328076 [1.84370]
MOM_ASCH [t-statistic]	-0.94768 [-1.00680]	-0.152993 [-1.49716]	-.123818 [-0.653013]
DAD_ASCH [t-statistic]	-0.260290 [-1.17510]	0.145296 [1.54188]	0.337804 [2.02447]
STU_PLAS [t-statistic]	0.087498 [0.484845]	0.241547 [2.63796]	0.241055 [1.41505]
PAR_ATTD [t-statistic]	-0.579475 [-2.88307]	-0.144011 [-1.52283]	-0.112543 [-0.620240]
PAR_OVER [t-statistic]	-0.508069 [-1.16363]	-0.197852 [-0.834805]	-0.768468 [-1.92925]
ITEMS [t-statistic]	0.00655936 [0.091043]	-0.028688 [-0.549243]	0.157122 [1.13142]
PAR_EDUC [t-statistic]	0.258085 [2.20073]	0.050582 [-0.906188]	-0.210935 [-2.39989]
DROP_SIB [t-statistic]	0.087682 [1.01414]	0.019873 [0.220765]	-0.286509 [-0.703878]
MARRIED [t-statistic]	-0.184445 [-0.677279]	-0.093182 [-0.573871]	-0.146780 [-0.411111]
RELIG [t-statistic]	-0.420314 [-1.49085]	RELIG < 1 perfectly collinear with criminality = 1	-0.278028 [-0.574487]
CULTURE [t-statistic]	0.035179 [0.515934]	0.00468712 [-0.139719]	0.052059 [0.808104]
PAR_EXP [t-statistic]	-0.263426 [-2.23304]	-0.166604 [-2.71297]	-0.175975 [-1.65810]
UNEMPLOY [t-statistic]	-0.099191 [-0.427295]	0.405229 [1.65312]	No unemployment
BOTHWORK [t-statistic]	0.00478633 [0.020454]	-0.00503743 [-0.046181]	0.026331 [0.130406]
LFAMINC [t-statistic]	-0.00142156 [-0.00811591]	0.171143 [1.06102]	0.319432 [1.60792]

**Table 4.10.1: Mean effect of the explanatory variables at the
mean of youth criminal activity**

Variable	%change in likelihood of behavior: low income	%change in likelihood of behavior: middle income	%change in likelihood of behavior: high income
DADHOUSE	Not significant	Not significant	Not significant
MOMHOUSE	Not significant	Not significant	Not significant
TALK_SCH	Not significant	Not significant	Not significant
TLKPLAN1	Not significant	Not significant	Not significant
TLKPLAN2	Not significant	Not significant	Not significant
MOM_ASCH	Not significant	Not significant	Not significant
DAD_ASCH	Not significant	Not significant	0.0071012
STU_PLAS	Not significant	0.007753	Not significant
PAR_ATTD	-0.023243	Not significant	Not significant
PAR_OVER	Not significant	Not significant	Not significant
ITEMS	Not significant	Not significant	Not significant
PAR_EDUC	0.010352	Not significant	-0.0044342
DROP_SIB	Not significant	Not significant	Not significant
MARRIED	Not significant	Not significant	Not significant
RELIG	Not significant	Not significant	Not significant
CULTURE	Not significant	Not significant	Not significant
PAR_EXP	-0.010566	-0.0054319	Not significant
UNEMPLOY	Not significant	Not significant	Not significant
BOTHWORK	Not significant	Not significant	Not significant
LFAMINC	Not significant	Not significant	Not significant

For the low income group parental expectations, PAR_EXP, the education level of the parent, PAR_ED, and the involvement of the parent in the child's school activities, PAR_ATTD, has become important in reducing child criminality. MARRIED is not significant in reducing youth criminality for this, or any other, income group. Therefore, single parenting does not lead to increased youth criminality, *ceteris paribus*.

The reduced mean level of DADHOUSE for the lower income group indicates that the child, because the father is not there, or, if the child is living with the father, the father is possibly out working or out looking for work, is having reduced contact with the father. The child must therefore rely more heavily on the mother's involvement in her child's scholastic progress (PAR_EXP is significant) and in school-centered activities, such as science fairs and school sports, for a sense of parental concern in what he or she does and accomplishes. The low overall influence of these variables says that, while they are significant in reducing child criminal activity, they may not be entirely adequate. If this is true then increasing the mean of DADHOUSE should increase its significance in reducing this at-risk behavior, *ceteris paribus*.

For the upper income group there are just two significant variables⁴, even while the model achieved an almost perfect score for overall fit. The proposition made in the discussion of criminal activity for the low income group, that increasing the mean of DADHOUSE should make DADHOUSE statistically significant does not appear to be proven; children are living with their fathers more and still this variable has no significant effect in reducing youth criminality.

Yet, it may not be that simple. The relationship between DADHOUSE and time actually spent by the child interacting with the father are not the same thing. At this high level of income it is likely that the father is forced to spend much time away from home, perhaps including business travel (note the high employment level coupled with high

⁴ RELIG could not be used in this model because of the approximate equality of $RELIG < 1$ and $CRIMINAL = 1$, so that the RELIG variable almost perfectly predicted CRIMINAL. The model fails to converge in this case.

income). This reduces the time the father can spend with his child (or children), even though the child may live with the father all of the time. At some point his influence over the child's behavior declines, as the mother, not the father, is seen as the daily provider of psychological shelter and counseling.

Parents raising their academic expectations for their children slightly decreases the chance that the youth will become criminally active. Youth having his or her own place to study slightly increases this likelihood; a logical explanation for this is not forthcoming. Having one's own room might enable stolen property to be more easily stashed, for example. But if this is true for stolen property it must also be true for drugs. It was not significant for any income group for that at-risk behavior, however.

For the upper income group there are only two statistically significant variables, and their marginal effects in sum are less than 1.6 percentage points collectively. The model struggles to produce any meaningful information. DAD_ASCH has become significant. As pointed out for the low income group, when the father is often absent in the children's life because the father has moved out or because the child does not often live with the father, then opportunities to spend time with the father become important, even while his influence as a day-in, day-out father has diminished. DAD_ASCH offers this opportunity. For the upper income case, the father might be absent from daily involvement in the child's life due to long work hours or business trips, making the after school opportunity to interact with the father important. Again, DAD_ASCH offers the high income child perhaps a rare opportunity to interact with his or her father; thus, the significance of DAD_ASCH.

Also of note is the lack of significance for the family income variable for all income groups for this at-risk behavior. This will be discussed further in the income conclusion below. The youth street gang and anti-social behavior probit results are shown in tables 4.11a-b.

Table 4.11.0: Probit for the probability of youth street gang participation and exhibit anti-social behavior

Variable	Estimate and t-statistic: low income group 83.39% correct predictions	Estimate and t-statistic: middle income group 89.75% correct predictions	Estimate and t-statistic: high income group 91.64% correct predictions
DADHOUSE [t-statistic]	-0.025709 [-0.212127]	-0.239282 [-3.92653]	-0.251103 [-2.19458]
MOMHOUSE [t-statistic]	-0.268917 [-1.85409]	-0.200194 [-3.92653]	-0.438586 [-2.76169]
TALK_SCH [t-statistic]	-0.262104 [-3.35408]	-0.040613 [-0.757794]	-0.118952 [-1.17537]
TLKPLAN1 [t-statistic]	0.081871 [1.12343]	-0.094727 [-2.06022]	-0.59831 [-2.27541]
TLKPLAN2 [t-statistic]	-0.00208915 [-0.030730]	0.021362 [0.483617]	-0.111342 [1.60554]
MOM_ASCH [t-statistic]	0.058875 [0.571621]	-0.062892 [-1.20450]	-0.031711 [-0.381092]
DAD_ASCH [t-statistic]	-0.203336 [-2.03237]	0.022300 [0.469752]	-0.024232 [-0.318514]
STU_PLAS [t-statistic]	0.037797 [0.460220]	0.079365 [1.68991]	0.111149 [1.55663]
PAR_ATT D [t-statistic]	-0.196134 [-2.39839]	-0.189071 [-3.94186]	-0.190247 [-2.43256]
PAR_OVER [t-statistic]	0.214930 [1.05084]	-0.190624 [-1.559134]	-0.209812 [-1.15651]
ITEMS [t-statistic]	0.00998975 [0.284981]	-0.018616 [-0.700827]	0.024629 [0.449609]
PAR_EDUC [t-statistic]	0.037222 [0.617987]	-0.071530 [-2.52799]	-0.123891 [-3.27010]
DROP_SIB [t-statistic]	0.057855 [1.35750]	0.116793 [2.87782]	0.079245 [0.678692]
MARRIED [t-statistic]	-0.027478 [-0.209083]	0.075685 [0.900069]	0.046602 [0.264069]
RELIG [t-statistic]	-0.106235 [-0.616589]	-0.131524 [-0.899855]	0.138811 [0.510176]
CULTURE [t-statistic]	0.048721 [1.53535]	0.010539 [0.617822]	0.017308 [0.635887]
PAR_EXP [t-statistic]	-0.194155 [-3.91057]	-0.170540 [-0.584146]	-0.104357 [-2.41394]
UNEMPLOY [t-statistic]	0.068892 [0.690670]	0.187901 [1.26510]	No unemployment
BOTHWORK [t-statistic]	-0.042161 [-0.386642]	0.00897948 [0.167046]	0.019731 [0.233615]
LFAMINC [t-statistic]	-0.121219 [-1.51339]	0.00755567 [0.095100]	0.026484 [0.299056]

Table 4.11.1: Mean effect of the explanatory variables at the mean of youth street gang participation and anti-social behavior

Variable	%change in likelihood of behavior: low income	%change in likelihood of behavior: middle income	%change in likelihood of behavior: high income
DADHOUSE	Not significant	-0.040489	-0.036216
MOMHOUSE	Not significant	-0.033861	-0.063257
TALK_SCH	-0.061717	Not significant	Not significant
TLKPLAN1	Not significant	-0.016022	-0.02052
TLKPLAN2	Not significant	Not significant	Not significant
MOM_ASCH	Not significant	Not significant	Not significant
DAD_ASCH	-0.047879	Not significant	Not significant
STU_PLAS	Not significant	Not significant	Not significant
PAR_ATTD	-0.046183	-0.040489	-0.027439
PAR_OVER	Not significant	Not significant	Not significant
ITEMS	Not significant	Not significant	Not significant
PAR_EDUC	Not significant	-0.012099	-0.017869
DROP_SIB	Not significant	0.019754	Not significant
MARRIED	Not significant	Not significant	Not significant
RELIG	Not significant	Not significant	Not significant
CULTURE	Not significant	Not significant	Not significant
PAR_EXP	-0.045717	-0.028845	-0.015051
UNEMPLOY	Not significant	Not significant	No unemployment
BOTHWORK	Not significant	Not significant	Not significant
LFAMINC	Not significant	Not significant	Not significant

The youth street gang participation and anti-social behavior discussion should be placed in the context of what the cited literature said about the attraction of youth to gangs. It states that they offer a sense of identity, belonging and shelter, all elements that might be missing from the lives of children in dysfunctional homes, regardless of family structure, i.e., marital status or whether the children live with both parents all or just some of the time. This model thus provides an important test of whether the

elements of identity, belonging and shelter are present in single parent families, *ceteris paribus*.

This model shows that MARRIED is not significant in affecting youth participation in street gangs or exhibiting anti-social behavior, for any income level. Single parent families do not, therefore, lead to a diminished sense of identity, belonging or shelter on the part of the children in these families, at least not to the extent of inclining them to seek youth street gang membership.

For the low income group family income is not significant. Discussing academics with the youth's school, the father being at home when the youth comes home from school, the parents attending school events and parents having expectations for the future of their youth all reduced the likelihood of youth gang activity and anti-social behavior.

For the middle and upper income groups the greatest reduction in the likelihood that the youth will become involved in a youth gang or exhibiting anti-social behavior comes from the presence of a mother in the home; with DADHOUSE being insignificant, she is the chief supplier of psychological comfort and worldly council.

Another reducer in this tendency is raising parental academic expectations for the child. The parents attending school activities, talking about school with the child, the level of parental education, and having educational items in the child's home also reduce the likelihood of street gang membership and anti-social behavior by youth. DROP_SIB slightly increases this likelihood.

The father being home when the child returns from school was significant for the low income group in reducing the likelihood of youth gang activity and anti-social

behavior but not significant for the middle or upper income groups. It could be that, considering the lowered mean value of DADHOUSE for the low income group compared to the middle income group, DAD_ASCH provides an important opportunity for low income children to interact with their fathers and receive important information about the outside world, while for the middle income children, DAD_ASCH is less important in this respect.

Six variables are significant for the upper income group. DROP_SIB and CULTURE are no longer significant. That MOMHOUSE and DADHOUSE is significant for reducing street gang participation and anti-social behavior, even while DADHOUSE is not in reducing criminality suggests that possibly the influence of gangs for children in this income bracket is less in evidence, but criminal opportunities are far less reduced by increasing income. The significance tests bear this out. Also, children of this income group have more opportunities for travel, such as extended school or scouting field trips, and opportunities to live away from home, for example, at summer camps and boarding schools. It is likely that street gang activity is not a great attraction for children living at boarding and preparatory schools, such as Choate, Tabor Academy or Andover.

Compared to the strong marginal effects of the variables seen for some of the other regressions, the marginal effects of the significant variables on the likelihood that youth will become involved in a street gang and anti-social behavior are mostly slight, except for the low income group. PAR_EXP are again significant in reducing youth gang activity and exhibiting anti-social behavior. The reason for this follows the logic

offered for the low income group, that where neighborhood modalities fail to provide examples of the typical hard working, at-risk behavior-avoiding person succeeding, then the home must provide such a standard for youth, as shown by the significance of PAR_ATTD, PAR_EDUC and PAR_EXP.

Family Income Discussion

Low family income discussion

This analysis has been able to separate individual variables of parenting ability from family income. The cited literature emphasized the importance of family income in determining outcomes for children, that low income blights young lives. The models presented here specifically test that hypothesis. Low income was not significant in increasing youth sexual activity, was significant in increasing the likelihood of youth criminality and youth street gang participation and anti-social behavior, and actually decreased the likelihood of youth drug and/or alcohol problems.

The reason why DADHOUSE, MOMHOUSE and PAR_OVER are significant for the entire survey regressions but not significant for this reduced group might have to do with the asserted nonlinearity of the presence of these variables and their affect in influencing youth behavior. There is no reason to assume that the relationship between any of the at-risk behaviors, and DADHOUSE, MOMHOUSE, or PAR_OVER is linear. For example, for a unit increase in DADHOUSE there is no reason to expect there to be a unit change in the dependent variable. If the relationship is nonlinear (quite possible, since there are far more nonlinear relationships than linear ones) a threshold

phenomenon might be at work; below a certain level of DADHOUSE its influence on the child is insignificant; but above this level its influence is more profound. The relationship might even be linear above this threshold value, but nonlinear, falling off rapidly, below it.

The time youth spend with their father, DADHOUSE, is significant in reducing sexual activity among youth in the low income group, however. This indicates the real significance of a father's input in influencing the sexual practices of his children, even if he has far less influence in other ways.

PAR_OVER, which measures parental oversight over the children in the family, is significant only in the drug and/or alcohol problem regression, even while the mean value and standard deviation for this group is almost identical to the entire survey group, and even while PAR_OVER is significant in all but the youth gang and anti-social behavior regression for the entire survey group. Because of the similarities in means and standard deviations, the explanation just offered for why DADHOUSE is not generally significant for the low income group cannot be used for PAR_OVER. The insignificance of PAR_OVER might be due to statistical reasons.

What has gained significance for the low income group is PAR_EXP. The role of parental expectations is significant in all but the regression on sexual activity. In this group, where most of the families are officially considered to be living in poverty, according to the U.S. Bureau of the Census, it is likely that the children inhabit substandard housing in economically marginalized neighborhoods. These neighborhoods offer children few examples of persons who have studied and worked hard and have

become economically successful; if they have become economically successful they have moved out of that neighborhood and into a nicer one. Thus, the children of these neighborhoods do not witness how hard work and academic diligence, how avoiding at-risk behaviors, has helped anyone *in their midst* to succeed. Therefore, these children cannot conclude that they will succeed economically or socially, based on the information that exists outside their door. They see no one who looks, dresses, and talks like them or like their older brothers, sisters and older relations and who lives where they live, who has any authority, power or stature in the larger society. Under such a situation, parental expectations, PAR_EXP, must act as the catalyst for children to succeed, and avoid at-risk behaviors. Related to this is the involvement of the parent or parents in the child's school, PAR_ATTD, such as attendance at school events like open house night, science fairs, etc.

MARRIED is not significant in reducing at-risk behaviors for the low income group. This means that single parenting does not increase the likelihood that youth will become involved in at-risk behaviors. The explanation for this behavior must be found elsewhere.

Middle family income discussion

Family income is significant only for the regression on the likelihood for drug and/or alcohol use by youth, *where it slightly increased this likelihood*. An increase in parental academic expectations for youth is significant for all the regressions; parental oversight for drug and/or alcohol problems and sexual activity regressions, but not for

the criminal activity or youth gang and anti-social behavior regressions. Therefore, it is concluded that *increasing money income for families is not found to reduce the likelihood that youth will become involved in at-risk behaviors.*

Religion has lost much of its influence in reducing at-risk behaviors compared to what it exercised for the low income group. Parental expectations, PAR_EXP, are also slightly less influential on the at-risk likelihoods. A possible explanation for this is that children of middle income families share common expectations that they will do well economically. There are tangible examples of this which they witness every day. They have older brothers and sisters in college; they know of others in their midst who have studied and worked hard and have become economically successful. There are persons who look, dress and talk like them in positions of authority who have avoided at-risk behaviors and have "made something of themselves." In this instance, while still important, PAR_EXP loses its rank as the main catalyst of youth avoiding at-risk behaviors.

When parental oversight is significant it is much more influential in reducing likelihood outcomes for the middle income group than for the low income group. The increase in the mean value of the presence of the father in middle income families, and its correlation with MARRIED compared to low income families, indicates that overseeing children, that is, setting and enforcing rules for the child's behavior, is less difficult, since two parents more often share these duties. Plus, with the father present more often, his influence on the children is more consistently felt. There is less opportunity for the children to ignore their father's input or to dismiss his input. This

buttresses the suggestion that the relationship between the left hand side outcomes and parental inputs in youth's lives may not be linear.

MARRIED is not significant in reducing one of the four youth at-risk behaviors. For the middle income group, single parenting does not generally increase youth at-risk behaviors.

High family income discussion

Increased family income is significant in the case of youth having a drug and/or alcohol problem, *and increases its likelihood*. It decreases the likelihood that youth will belong to a youth street gang or exhibiting anti-social behavior, or be criminally active, while it has no significant effect on youth sexual activity. In these same models parental oversight is significant and exercised a negative effect on these likelihoods. For the criminal activity, and youth gang activity and anti-social behavior models, parental oversight is not significant. There would seem to be a link at the margin between high family income levels and both parents working, and parental oversight.

This illustrates the difference between DADHOUSE, the amount of time the child lives with the father, and PAR_OVER, the amount of time parents dedicate to overseeing their child(ren)'s behavior. With more parental time dedicated to earning income, there is less time for parental oversight, or on the other hand, parental oversight is valued more by the children involved. As suggested above, the relationship between a variable like parental oversight and the left hand side outcomes of the equations is not likely to be linear. The possibility exists, therefore, that below some value parental oversight fails

to exert a strong influence because it is not present consistently enough to provide useful information and experiences for youth to benefit from (DiIulio 1996, i). However, once a minimum level is reached it makes a difference in the actions of youth, and more of it makes more of a difference.

MARRIED is only once significant in reducing the likelihood of youth becoming involved in at-risk behaviors. Single parenting does not generally increase this likelihood.

Family Income Summary

This discussion now treats all the individual at-risk youth behaviors as one, concentrating on the individual variable's effect in generally reducing all of them. The purpose of separately modeling low, middle and high family income levels is to see the marginal effects of the explanatory variables for each group, particularly the family income variable effects. For the middle and upper income groups, increasing family money income *increases* the likelihood of youth having a drug and/or alcohol problem. Significance tests of the differences of the means for the different earnings levels did show that increasing income reduces youth street gang membership and anti-social behavior, and criminal activity; it had no significant effect on youth sexual activity, but increased the likelihood that youth will have a drug and or alcohol problem. Table 4.12 summarizes the results of the hypothesized significance for each variable. This study has only concentrated on a few of these; a thorough study of the rest, and of the various implications for each one is recommended as a subject for further research.

Table 4.12: Significant variables in order of at-risk behaviors tested
 Drug and/or alcohol problems; sexual activity; criminal activity; gang and anti-social activity

Variable	Total survey group	Low income group	Middle income group	High income group
DADHOUSE	yes; yes; no; yes	no; yes; no; no	yes; yes; no; yes	no; no; no; yes
MOMHOUSE	no; yes; yes; yes	no; no; no; no	no; no; no; yes	no; no; no; yes
TALK_SCH	no; no; no; yes	no; no; no; yes	no; no; no; no	no; no; no; no
TLKPLAN1	no; yes; no; yes	no; no; no; no	no; no; no; yes	no; no; no; yes
TLKPLAN2	no; no; no; no	no; no; no; no	no; no; no; no	no; no; no; no
MOM_ASCH	no; yes; no; no	no; no; no; no	no; yes; no; no	no; no; no; no
DAD_ASCH	no; no; no; no	no; no; no; yes	no; no; no; no	no; no; yes; no
STU_PLAS	no; no; yes; yes	no; yes; no; no	no; no; yes; no	no; no; no; no
PAR_ATTD	no; no; yes; yes	no; no; yes; yes	yes; no; no; yes	no; no; no; yes
PAR_OVER	yes; yes; yes; no	yes; no; no; no	yes; yes; no; no	no; yes; no; no
ITEMS	yes; no; no; no	yes; no; no; no	no; no; no; no	no; no; no; no
PAR_EDUC	yes; yes; no; yes	no; no; yes; no	yes; yes; no; yes	yes; yes; yes; yes
DROP_SIB negative effect	yes; yes; no; yes	no; no; no; no	yes; no; no; yes	no; no; no; no
MARRIED	yes; yes; no; no	no; no; no; no	no; yes; no; no	yes; no; no; no
RELIG	yes; yes; no; no	yes; yes; no; no	no; no; n/a; no	no; no; no; no
CULTURE	yes; no; no; no	no; no; no; no	yes; yes; no; no	no; no; no; no
PAR_EXP	yes; yes; yes; no	yes; no; yes; yes	yes; yes; yes; yes	no; no; no; yes
UNEMPLOY negative effect	no; no; no; no	no; no; no; no	no; no; no; no	n/a
BOTHWORK negative effect	yes; yes; no; no	no; no; no; no	no; yes; no; no	no; yes; no; no
LFAMINC negative effect	yes; yes; no; no	no; no; no; no	no; no; no; no	yes; yes; no; no

While it is not impossible, it is unlikely that a family with a mean income of \$11,000.00 has two parents living at home, with the potential for earning two paychecks, as shown by the mean value for BOTHWORK for low and middle or high income groups, 0.22774 vs 0.62423 vs 0.70061 respectively. Compare the means for MARRIED and DADHOUSE between the low income and the other income groups; they

are lower for low income and higher for the other two groups. While MARRIED and DADHOUSE are highly correlated for all groups, so that when MARRIED is low so is DADHOUSE, they measure different things and must be treated separately. DADHOUSE measures the effect the father's presence has on the children, as much as this can be measured; MARRIED measures the entirely different effect that the parents being married to one another has on the lives of the children.

MARRIED is not generally significant in reducing at-risk behavior when viewed across income groups. This means that single parenting does not lead to increases in youth at-risk behaviors. This refutes much of the literature cited in this chapter.

Low income is not significant; when it is, increasing income increases at-risk behavior by youth. This is also in direct refutation of the literature cited in this chapter. Whatever the threat to youth posed by poor living conditions, single parenting and lack of money income are not, in themselves, responsible for it.

DADHOUSE has a mixed effect in reducing youth at-risk behavior, but its effect is always in reducing it; MOMHOUSE has a slightly lesser effect. The reasons for this might be involved with how children view the information about the outside world proffered by mothers and fathers, especially as they become teenagers.

PAR_EXP was generally significant in reducing at-risk behaviors across income groups; only for the high income group was this not true. There is nothing to refute that these expectations provide children with a strong signal as to what is expected of them, and becomes tied with their identity if they are able to achieve academically.

PAR_OVER was hypothesized to be a significant reducer of youth at-risk behavior. The results are mixed; it did well in reducing at-risk behaviors for the low income group, but less well for the other income groups.

RELIG loses all significance in reducing at-risk behavior as income is increased. PAR_EDUC, on the other hand, gained significance as income increased, being significant in reducing all at-risk behaviors for the upper income group.

Conclusion

It was hypothesized that certain family background characteristics experienced by eighth graders would be important in influencing their likelihood of becoming involved in the at-risk behaviors of drug and/or alcohol use, sexual activity, criminality and/or street gang participation and anti-social behavior, once they had reached the twelfth grade, or after the passage of four years. The study finds that family background characteristics do indeed affect such likelihoods. Parental oversight, parental expectations, the father's association with the children, the mother's association with the children, the presence of religion in the home, cultural enrichment experiences for the children, the parents attending school activities, the presence of educational items in the home, and the parents being married to one another, were all, to some degree, found to reduce the likelihood of youth becoming involved in the at-risk behaviors at least some of the time for low, middle and high income groups.

It was further found that single parenting is generally not responsible for increases in the likelihood of youth becoming involved with at-risk behaviors. Only in a few

instances was the parents being married to one another significant in reducing a particular at-risk behavior.

Lack of money is not, in itself, to blame for youth at-risk behavior increases. In fact, the study found that when family income was significant, its marginal effect was to increase the at-risk behavior of youth drug and/or alcohol use.

Taken altogether, the elements of religion in the home, of close association of the child with the parents, the parents being married, parental involvement in their children's school, and increased parental academic expectations for their children, all seem to add to the lives of children and youth in some basic ways. They are institutional emanations, as discussed in chapter 2, and thereby affect the tastes and preferences of youth. Since they can provide a sense of continuity and inner structure for children and youth, within which planning horizons are extended and individual impatience can be transformed into patience and self-control. As cited above, DiIulio has stated how important such structures are, when consistently applied, to the ability of youth in avoiding criminal activity. There is no reason to think that they would be any less important in helping youth to avoid other at-risk behaviors as well. The data in this study show that most of these are indeed significant in reducing the likelihood of youth becoming involved in at least some of these at-risk behaviors, more so for drug and/or alcohol use and sexual activity, less so for criminal activity, and street gang membership and anti-social behavior.

Further research

Research in the statistical properties of panel data studies might yield improved methodologies that would aid this and other such studies. A computer simulation requires statistical subprograms and subroutines; more needs to be known about the nature of their output.

It would be interesting to study the effects on children of the different reasons for single parenting. Are children more likely to engage in at-risk behaviors if they come from families where the single parent has never been married, as compared to single parent families due to divorce or widowhood? How important to the future success of the child is the age of the mother when the child was born?

Another area of interest is the degree to which the education of the mother affects the future prospects of the next generation. Since she is the first educator of her children, her educational and experiential attainment would seem to have a great influence on their maturation. In many societies, including the American one to some extent, most of the educational investment is made in males. In times of family stress leading to divorce the loss of the father means that the family has lost this important source of economic capital, as the cited literature in this chapter shows. Research in this area might help to explain how much of the loss of the father from the home is represented by the loss of his educational capital and how much by what is intrinsic to the condition of fatherhood. The importance of the father in raising children is becoming evident, but there is still too little known about the nature of his noneconomic contribution to the family. If the mother had the same or greater educational capital than

the father would the loss of the father still be as detrimental to the maturation of the children? These are some of the topics of research interest suggested by this study.

The findings on the positive effect religious activities have in reducing at-risk behaviors among youth are intriguing. They provide an incentive to investigate the process whereby religion in its most general sense affects the behavior of children and families. Certainly, religious teachings tend to focus on sacrificing immediate wants for the promise of greater rewards in the future of this life or in a future life. Such an emphasis encourages the development of long range thinking, i.e., in a long planning horizon, and in reducing the subjective rate of time preference.

There needs to be more research on the sexual practices of youth, and of what influences these practices.

The whole topic of institutions and their effect on forming tastes and preferences needs greater scrutiny. What is their effect on family structure, and how do they affect decisions to remain as a family member or leave? Different societies treat the family, its contributions and requirements, in different ways. What is the connection between religion and the family? This subject has been largely ignored by economists while economics might offer a structure for fruitful investigation.

SUMMARY AND CONCLUSION

This study has analyzed different aspects of human capital formation and its needed factors. The context is applied resource economics. Human capital is the primary capital form, needed to form all other capital and finished goods. Its formation constitutes the most basic investment of any economy and the first step that must be taken on any path of wealth creation. The economic success of an individual, a family, tribe, clan, village or nation is absolutely dependent upon its generation and maintenance.

This study has established the mechanism whereby subjective rates of time preference and subjective planning horizons are altered, both individually and in the aggregate. It has also established that investing is the means whereby wealth is created, and that the process of investment is *learned behavior*, taught by one generation to the next, and that teaching this lesson is itself a form of intergenerational investment. It has modeled intergenerational investments and the effects of varying subjective rates of time preferences, and discussed the effects of subjective planning horizons on the decision to invest in one's self or in others. The study has then empirically investigated a set of the likelihood of youth becoming involved in at-risk behaviors in the presence of different amount of a set of investment variables, such as family capital.

A set of aggregate social manifestations has been analyzed in order to determine whether Americans have recently increased their subjective rate of time preference. Deciding upon acceptable criteria for data that would conclusively test this hypothesis is

problematic. Nevertheless, this study can conclude that the eroding state of child welfare in America cannot test whether the aggregate of American tastes and preferences has shifted toward higher rates of time preference (increased impatience) and diminished planning horizons, since other reasons can be offered to explain this erosion. There are more divorces in 1996 than there were in 1956, and more children are being raised by single parents today than forty years ago; but this increase in the complexity of living arrangements does not necessarily point to our becoming more now-centered compared to forty years ago.

Data show that, as individuals, Americans are entering colleges and universities more than ever before. They also seem to be taking up musical instruments, becoming top athletes, learning foreign languages, etc. These are all practices that require sacrificing current-period wants to obtain future rewards; their continuation at levels unchanged from previous decades is a sign that, in terms of the willingness to forgo current consumption opportunities for future gains, Americans are just as willing to do so as ever. This indicates that tastes in this regard have not changed. American corporations also seem to be generating as much research and development as ever. Based on these data, it is clear that there has been no shift in the American rate of time preference causing a reduction in the willingness to invest.

The increase in child poverty that was cited in this study clearly indicates that Americans are turning away from investing in children. Even if Americans are disinvesting in children compared to investment levels in decades past, is it because their rate of impatience is increasing or because of some other reason? If utility functions are

not becoming intertemporally myopic, which is what is being concluded, then are they becoming *interpersonally* myopic? Is the difficulty for children not that their elders are neglecting to worry about the future and are too impatient to invest, but that their elders are simply becoming less concerned about the welfare of others? Such a hypothesis changes the perspective of the research, but not the results of the research, vis a vis the welfare of children and the future of the economy.

The mathematical paper showed the seriousness of cutting back in investment in human capital formation. It also suggested two possible ways that an economy could wither over time: The first way, which was hypothesized in this study, is that market agents become too impatient and fail to adequately invest enough of current wealth for future needs. The second possibility is that agents simply choose not to dedicate any current wealth in the form of a bequest for the exclusive use of the next generation, not because they are impatient but because they want all the wealth for their own use, including for their own investments. This latter possibility cannot be ruled out.

The question to be addressed is not whether R & D is still being carried on, or whether children are graduating from high schools and colleges as before, but rather, at what rate these activities would be carried on were Americans to invest as they might, i.e., as other citizens in their nations are now doing. Without new human capital formation there is less investment and thus less wealth creation. Over time this makes the gains in group economics a zero-sum game, between nations, communities, and between generations. This study has argued that evidence exists which shows that the intergenerational zero-sum game has begun, leaving the weaker generation, that is, the

children, at economic risk. In the final analysis, what matters is the number of children who become mature, independent adults as a percentage of the American population. This is the real test of whether Americans have shifted their tastes and preferences from investment in children to increasing consumption for themselves.

It has been asserted that the rate of time preference is reduced as we get older, a result of our receiving various measured inputs into our environment in a timely fashion as we grow up. By extension, lacking these inputs reduces the likelihood that the rate of time preference will be reduced. Saying that the investment process is learned behavior, taught by one generation to the next, translates the rate of time preference discussion into practical economic terms. The analysis of youth involvement in risky behaviors, given background characteristics, is an application of the rate of time preference analysis in economics. It brings together the idea of investment (participation by parents in their children and by children in school life) and disinvestment (absenteeism of parents and child participation in risky behaviors). The link was shown between family background characteristics (inputs) and youth behavioral outcomes (production), specifically, how important intact families are to positive later outcomes for maturing youth. Therefore, there exists adequate information on both the importance of the rate of time preference or the rate of selfishness in affecting investment decisions and the results for the next generation of a failure of self-investment.

Clearly, a shift in the subjective rate of time preference, while mathematically pliant for modeling changes in tastes and preferences, should not be allowed to subsume other possible changes in the tendencies of market agents. The importance in the

planning horizon has been mentioned; myopic planning horizons do not allow the individual to apprehend the full consequences of actions taken in the present. A diminishment of the sense of shared community values leads directly to the formation of utility functions in youth which are interpersonally detached. If they are also intertemporally detached, there is nothing to force persons to care for the most vulnerable and most important cohort of the population, the young.

What is not known is the scale of the problem: how large is it? Also, how permanent are these preference changes? What institutions cause these changes and what is the mechanism whereby institutions can be changed according to the stated requirements of society?

The analytical base provided by the three chapters of this study allows some conclusions to be made concerning juvenile crime. These can shed light about the future size of the problem of economically dependent individuals brought about by preference changes in consumption and investment, and how to evaluate possible approaches to the problem. Two phenomena are intimately involved with investment preference changes: (1) public expenditures of all classes on both the transformation of youth into mature economic adults, and (2) the future need to address social costs resulting from youth involvement in at-risk behaviors. Some of the cited literature indicates that there is an inverse relationship between expenditures on the former, and the near future need to dedicate public funds on the latter. As shown by the current noisy public debate about juvenile crime, the strength of the relationship is disputed. But it can be concluded that, *ceteris paribus*, the nature of childhood, with his myopic planning horizon and high rate

of time preference, will not be influenced to reduce criminal activity by increasing the severity of the punishment; rather, what is required is to speed up the punishment process, to keep it within the planning horizon of the youth offender, and simultaneously work to increase the planning horizon and reduce the rate of time preference.

The positive relationship between family inputs and youth's ability to avoid at-risk behaviors has been shown; by logic, depriving youth of these essential inputs increases their involvement in at-risk behaviors. This result can be explained by the effect parental inputs have in reducing the subjective rate of time preference of youth. This reduction allows youth to conceptualize future costs and benefits to avoid at-risk behaviors and invest in themselves. It also turns "the future" from a meaningless abstraction to a measured time line, increasing the youth's planning horizon.

The metamorphosis of future time from an abstraction to a vehicle delivering tangible benefits and costs is therefore unambiguously linked to youth experiencing positive childhood inputs. Again, the lack of such inputs threatens this metamorphosis, and suggests that the current political incentive to increase the severity of punishments for juvenile crimes will not have positive results. Because many juveniles involved in criminal behavior have come from dysfunctional homes where parent or guardian inputs are lacking or are inconsistently applied (DiIulio 1996; i, ii), their rate of time preference and planning horizon is little changed from what it was when they were toddlers. Such youth offenders, who cannot conceive of future time beyond a few days, are thrown into a criminal justice system that takes months or years to grind out its results. How are

they expected to learn anything from such an experience? How will this reduce juvenile criminality?

An important conclusion of this study is that the private decision to marry, divorce and have children, in or out of wedlock, and the parent's attitude toward their role as the primary educator, nurturer, supporter, etc., is shown to have external consequences. Youth are shown to alter their involvement in at-risk behaviors according to the nature and amount of such inputs. It was also shown that the relationship between inputs in the life of children and changes in their behavior is not likely to be linear: for a percentage change in the input in question there may be an equal, greater than, or less than equal percentage point response in the youth behavior that results.

In the final analysis, all inputs into the maturing child result in that child forming a set of tastes and preferences that will rule his or her life, and determine the nature of his or her participation in the economy and society. Proper education can internalize public awareness of this, generating individual utility functions that link the needs of others, both living and unborn, to one's own. This is the basic requirement for dynamic economic stability and a civilized society.

APPENDIX A
QUESTIONS USED IN THE STUDY
AND HOW THEY WERE CODED BY VARIABLES

Family composition variables in order of use in the study. All multiple responses, refusals, legitimate skips (not applicable), and missing responses have been stripped out for model variables.

Variable[4461]: BYP1A1 R^S RELATIONSHIP TO EIGHTH GRADER			
Code	Freq	Percent	Label
01	17600	77.7	MOTHER
02	3954	17.5	FATHER
03	234	1.0	STEPMOTHER
04	156	0.7	STEFFATHER
05	256	1.1	GRANDMOTHER
06	26	0.1	GRANDFATHER
07	91	0.4	OTHER FEM. RELATIVE
08	30	0.1	OTHER MALE RELATIVE
09	119	0.5	OTHER FEM. GUARDIAN
10	24	0.1	OTHER MALE GUARDIAN
96	43	0.2	{MULTIPLE RESPNSE}
97	9	0.0	{REFUSAL}
98	109	0.5	{MISSING}

Variable[4462]: BYP1A2 PARTNER^S RELATIONSHIP TO 8TH GRADER			
Code	Freq	Percent	Label
01	3322	14.7	MOTHER
02	11713	51.7	FATHER
03	343	1.5	STEPMOTHER
04	2039	9.0	STEFFATHER
05	75	0.3	GRANDMOTHER
06	142	0.6	GRANDFATHER
07	31	0.1	OTHER FEM. RELATIVE
08	64	0.3	OTHER MALE RELATIVE
09	68	0.3	OTHER FEM. GUARDIAN
10	270	1.2	OTHER MALE GUARDIAN
11	4270	18.9	NO OTH PARENT/GUARDN
96	25	0.1	{MULTIPLE RESPNSE}
97	18	0.1	{REFUSAL}
98	271	1.2	{MISSING}

If bypla1=2 or bypla2=2 then DADHOUSE=1; else DADHOUSE=0.
If bypla1=1 or bypla2=1 then MOMHOUSE=1; else MOMHOUSE=0.

Variable[4463]: BYP1B AMT OF TIME STUDENT LIVES W/RESPONDENT			
Code	Freq	Percent	Label
1	21839	96.4	ALL OF THE TIME
2	511	2.3	MORE THAN HALF TIME
3	141	0.6	HALF OF THE TIME
4	112	0.5	LESS THAN HALF TIME
5	21	0.1	NONE OF THE TIME
7	3	0.0	{REFUSAL}
8	24	0.1	{MISSING}

If byp1b=1 then TIMELIVE=2; else if byp1b=2 then TIMELIVE=1.
Else TIMELIVE=0.

```

-----
Variable[ 4666]:  BYP66  HOW OFTN TALKS TO CHLD ABT SCHL EXPERNCs
      Code  Freq Percent      Label
      1    150      0.7 NOT AT ALL
      2    531      2.3 RARELY
      3   3982     17.6 OCCASIONALLY
      4  17438     77.0 REGULARLY
      6     5       0.0 {MULTIPLE RESPNSE}
      8    545      2.4 {MISSING}

```

If byp66=1 or =2 then TLK_SCH=0; else if byp66=3 then TALK_SCH=1.
Else TALK_SCH=2.

```

-----
Variable[ 4667]:  BYP67  HOW OFTN TALKS TO CHILD ABOUT H.S. PLANS
      Code  Freq Percent      Label
      1    471      2.1 NOT AT ALL
      2   1650      7.3 RARELY
      3   9579     42.3 OCCASIONALLY
      4  10876     48.0 REGULARLY
      6     2       0.0 {MULTIPLE RESPNSE}
      7     4       0.0 {REFUSAL}
      8    69      0.3 {MISSING}

```

If byp67=1 or =2 then TLKPLAN1=0; else if byp67=3 then TLKPLAN1=1.
Else if byp67=4 then TLKPLAN1=2.

```

-----
Variable[ 4668]:  BYP68  HOW OFT TALKS TO CHLD RE POST H.S. PLANS
      Code  Freq Percent      Label
      1    798      3.5 NOT AT ALL
      2   2359     10.4 RARELY
      3  10717     47.3 OCCASIONALLY
      4   8708     38.4 REGULARLY
      7     4       0.0 {REFUSAL}
      8    65      0.3 {MISSING}

```

If byp68=1 or =2 then TLKPLAN2=0; else if byp68=3 then TLKPLAN2=1.
Else if byp68=4 then TLKPLAN2=2.

```

Variable[ 4672]:  BYP72A  MOTHER HOME WHEN
CHILD RETURNS FROM SCHOOL
      Code  Freq Percent      Label
      1  13013     57.5 USUALLY
      2  3295     14.5 SOMETIMES
      3  2786     12.3 RARELY
      4  2901     12.8 NEVER
      6     3       0.0 {MULTIPLE RESPONSE}
      7    27      0.1 {REFUSAL}
      8   626      2.8 {MISSING}

```

If byp72a=1 or =2 then MOM_ASCH=1; else MOM_ASCH=0.

Variable[4673]: BYP72B FATHER HOME WHEN
CHILD RETURNS FROM SCHOOL

Code	Freq	Percent	Label
1	3702	16.3	USUALLY
2	4869	21.5	SOMETIMES
3	5373	23.7	RARELY
4	7455	32.9	NEVER
6	7	0.0	{MULTIPLE RESPONSE}
7	32	0.1	{REFUSAL}
8	1213	5.4	{MISSING}

If byp72b=1 or =2 then DAD_ASCH=1; else DAD_ASCH=0.

BYP72A (MOM_ASCH), AND BYP72B (DAD_ASCH), MISSING.

If byp72a=1 or =2 then MOM_ASCH=1; else MOM_ASCH=0.

If byp72b=1 or =2 then DAD_ASCH=1; else DAD_ASCH=0.

Variable[82]: BYS35A R'S FAMILY HAS SPECIFIC PLACE FOR STUDY

Code	Freq	Percent	Label
1	10194	41.4	HAVE
2	13596	55.3	DO NOT HAVE
6	1	0.0	{MULTIPLE RESPNSE}
8	808	3.3	{MISSING}

If byp35a=1 then STU_PLAS=1; else STU_PLAS=0.

Variable[104]: BYS37D R'S PARENTS ATTENDED A SCHOOL EVENT

Code	Freq	Percent	Label
1	14926	60.7	YES
2	8367	34.0	NO
3	815	3.3	DON'T KNOW
6	3	0.0	{MULTIPLE RESPONSE}
8	488	2.0	{MISSING}

If bys37d=1 then PAR_ATTD=1; else PAR_ATTD=0.

Variable[4659]: BYP64A FAMILY RULE ABOUT PGMS CHILD MAY WATCH

Code	Freq	Percent	Label
1	14899	65.8	YES
2	6965	30.7	NO
6	2	0.0	{MULTIPLE RESPONSE}
8	785	3.5	{MISSING}

If byp64a=1 then TVPROGRM=1; else TVPROGRM=0.

Variable[4660]: BYP64B FAMILY RULE HOW EARLY/LATE CHLD WATCH TV

Code	Freq	Percent	Label
1	18273	80.7	YES
2	3574	15.8	NO
6	1	0.0	{MULTIPLE RESPONSE}
8	803	3.5	{MISSING}

If byp64b=1 then TVLATE=1; else TVLATE=0.

```
Variable[ 4661]:  BYP64C    FAMILY RULE HOW MANY HRS CHILD WATCH TV
Code   Freq Percent   Label
1     9332   41.2 YES
2    12428   54.9 NO
6         1    0.0 {MULTIPLE RESPNSE}
8     890    3.9 {MISSING}
```

If byp64c=1 then TVHOURS=1; else TVHOURS=0.

```
-----
Variable[ 4663]:  BYP65A    FAMILY RULE ABOUT MAINTAINING GRADE AVG
Code   Freq Percent   Label
1    15684   69.2 YES
2     6194   27.3 NO
6         3    0.0 {MULTIPLE RESPNSE}
8     770    3.4 {MISSING}
```

If byp65a=1 then MAINTGPA=1; else MAINTGPA=0.

```
-----
Variable[ 4664]:  BYP65B    FAMILY RULE ABOUT DOING HOMEWORK
Code   Freq Percent   Label
1    20188   89.1 YES
2     1830    8.1 NO
6         1    0.0 {MULTIPLE RESPNSE}
8     632    2.8 {MISSING}
```

If byp65b=1 then HW_RULE=1; else HW_RULE=0.

```
-----
Variable[ 4665]:  BYP65C    FAMILY RULE ABOUT DOING HOUSEHOLD CHORES
Code   Freq Percent   Label
1    19427   85.8 YES
2     2510   11.1 NO
6         2    0.0 {MULTIPLE RESPNSE}
8     712    3.1 {MISSING}
```

If byp65c=1 then DOCHORES=1; else DOCHORES=0.

```
-----
Variable[ 4669]:  BYP69     HOW OFTEN HELP CHILD WITH HOMEWORK
Code   Freq Percent   Label
1     6666   29.4 SELDOM OR NEVER
2     6049   26.7 ONCE/TWICE A MONTH
3     6948   30.7 ONCE/TWICE A WEEK
4     2299   10.1 ALMOST EVERY DAY
6         2    0.0 {MULTIPLE RESPNSE}
8     687    3.0 {MISSING}
```

If byp69=3 or =4 then HELP_HW=2; else if byp69=2 then HELP_HW=1.
Else HELP_HW=0.

```
Variable[ 105]:  BYS38A  HOW OFTEN PARENTS CHECK ON R^S HOMEWORK
Code  Freq Percent  Label
1  10707  43.5  OFTEN
2  7210  29.3  SOMETIMES
3  4102  16.7  RARELY
4  2395  9.7  NEVER
6  2  0.0  {MULTIPLE RESPNSE}
8  183  0.7  {MISSING}
```

If bys38a=1 then HWRK_HLP=1; else HWRK_HLP=0.

```
-----
Variable[ 108]:  BYS38D  HOW OFTN PRNTS LIMIT GOING OUT WTH FRNDS
Code  Freq Percent  Label
1  10367  42.1  OFTEN
2  7317  29.7  SOMETIMES
3  3862  15.7  RARELY
4  2770  11.3  NEVER
6  2  0.0  {MULTIPLE RESPNSE}
8  281  1.1  {MISSING}
```

If bys38d=1 or =2 then LIM_FREN=1; else LIM_FREN=0.

PAR_OVER= (TVPROGRM+TVLATE+TVHOURS+MAINTGPA+HW_RULE+DOCHORES+
HELP_HW+HWRK_HELP+LIM_FREN)/9

```
-----
Variable[ 85]:  BYS35D  R^S FAMILY HAS AN ENCYCLOPEDIA
Code  Freq Percent  Label
1  18989  77.2  HAVE
2  4957  20.2  DO NOT HAVE
6  7  0.0  {MULTIPLE RESPNSE}
8  646  2.6  {MISSING}
```

If bys35d=1 then ENCYCLO=1; else ENCYCLO=0.

```
-----
Variable[ 86]:  BYS35E  R^S FAMILY HAS AN ATLAS
Code  Freq Percent  Label
1  16464  66.9  HAVE
2  7262  29.5  DO NOT HAVE
6  2  0.0  {MULTIPLE RESPNSE}
8  871  3.5  {MISSING}
```

If bys35e=1 then ATLAS=1; else ATLAS=0.

```
-----
Variable[ 87]:  BYS35F  R^S FAMILY HAS A DICTIONARY
Code  Freq Percent  Label
1  23578  95.8  HAVE
2  549  2.2  DO NOT HAVE
6  9  0.0  {MULTIPLE RESPNSE}
8  463  1.9  {MISSING}
```

If bys35f=1 then DICTION=1; else DICTION=0.

```
Variable[ 94]: BYS35M R^S FAMILY HAS MORE THAN 50 BOOKS
Code Freq Percent Label
1 21327 86.7 HAVE
2 2605 10.6 DO NOT HAVE
6 4 0.0 {MULTIPLE RESPNSE}
8 663 2.7 {MISSING}
```

If bys35m=1 then BOOKS=1; else BOOKS=0.

```
-----
Variable[ 96]: BYS35O R^S FAMILY HAS A POCKET CALCULATOR
Code Freq Percent Label
1 22792 92.7 HAVE
2 1229 5.0 DO NOT HAVE
6 5 0.0 {MULTIPLE RESPNSE}
8 573 2.3 {MISSING}
```

If bys35o=1 then CALCULAT=1; else CALCULAT=0.

ITEMS=ENCYCLO+ATLAS+DICTION+CALCULAT+BOOKS.

```
-----
Variable[ 4526]: BYP30 HIGHEST LEVEL OF EDUCATION R COMPLETED
Code Freq Percent Label
01 1193 5.3 EIGHTH GRADE OR LESS
02 1983 8.8 NOT H.S GRADUATION
03 631 2.8 GED
04 4777 21.1 H.S GRADUATION
05 1456 6.4 VOC,TRADE,BUS < 1 YR
06 1312 5.8 VOC,TRADE,BUS 1-2YRS
07 575 2.5 VOC,TRADE 2YRS OR >
08 2896 12.8 LESS THAN 2 YRS COLL
09 1996 8.8 2 OR MORE YRS COLL
10 788 3.5 FINISHED 2YR PROGRAM
11 2982 13.2 FINISHED 4-5YR PROG
12 1474 6.5 MASTER^S DEGREE
13 496 2.2 PH.D., M.D.,OTHR PRO
97 17 0.1 {REFUSAL}
98 75 0.3 {MISSING}
```

If byp30=1 or =2 then EDUC1=0; else if byp30= 3 or =4 or =5 or =6 or =8 then
EDUC1=1; else if byp30=7 or =9 or =10 then EDUC1=2;
else if byp30=11 then EDUC1=3; else EDUC1=4.

```
-----
Variable[ 4527]: BYP31 SPOUSE^S HIGHEST LEVEL OF EDUC COMPLETED
Code Freq Percent Label
01 1323 5.8 EIGHTH GRADE OR LESS
02 1746 7.7 NOT H.S GRADUATION
03 502 2.2 GED
04 3891 17.2 H.S GRADUATION
05 668 2.9 VOC,TRADE,BUS < 1 YR
06 899 4.0 VOC,TRADE,BUS 1-2YRS
07 670 3.0 VOC,TRADE 2YRS OR >
08 1982 8.8 LESS THAN 2 YRS COLL
09 1537 6.8 2 OR MORE YRS COLL
10 622 2.7 FINISHED 2YR PROGRAM
11 2531 11.2 FINISHED 4-5YR PROG
12 1247 5.5 MASTER^S DEGREE
13 915 4.0 PH.D., M.D.,OTHR PRO
14 3923 17.3 DOES NOT APPLY
97 39 0.2 {REFUSAL}
98 156 0.7 {MISSING}
```


If byp30=1 or =2 then EDUC2=0; else if byp30= 3 or =4 or =5 or =6 or =8 then
 EDUC2=1; else if byp30=7 or =9 or =10 then EDUC2=2;
 else if byp30=11 then EDUC2=3; else EDUC2=4.

PAR_EDUC=EDUC1+EDUC2/2.

```

-----
Variable[ 4470]:  BYP6  NUMBER OF CHILDREN WHO DROPPED OUT OF HS
      Code  Freq Percent      Label
      00  11158   49.3  NONE
      01   1347    5.9  ONE
      02    425    1.9  TWO
      03    177    0.8  THREE
      04    91    0.4  FOUR
      05    47    0.2  FIVE
      06    41    0.2  SIX OR MORE
      98   684    3.0 {MISSING}
      99  8681   38.3 {LEGITIMATE SKIP}

```

If byp6=99 then DROP_SIB=0; else DROP_SIB=byp6.

```

-----
Variable[ 4471]:  BYP7  R^S CURRENT MARITAL STATUS
      Code  Freq Percent      Label
      01  2600   11.5  DIVORCED
      02   550    2.4  WIDOWED
      03   863    3.8  SEPARATED
      04   565    2.5  NEVER MARRIED
      05   393    1.7  MARRIAGE-LIKE RELAT.
      06 17048   75.3  MARRIED
      96    8    0.0 {MULTIPLE RESPNSE}
      98   624    2.8 {MISSING}

```

If byp7=6 then MARRIED=1; else MARRIED=0

```

-----
Variable[ 4525]:  BYP29  RELIGIOUS BACKGROUND
      Code  Freq Percent      Label
      01  4605   20.3  BAPTIST
      02  1792    7.9  METHODIST
      03  1220    5.4  LUTHERAN
      04   909    4.0  PRESBYTERIAN
      05   546    2.4  EPISCOPALIAN
      06  1498    6.6  OTHER PROTESTANT
      07  7226   31.9  CATHOLIC
      08    84    0.4  EASTERN ORTHODOX
      09  1556    6.9  OTHER CHRISTIAN
      10   495    2.2  JEWISH
      11    60    0.3  MOSLEM
      12   211    0.9  BUDDHIST
      13    81    0.4  HINDU
      15   768    3.4  OTHER
      16   554    2.4  NONE
      96   105    0.5 {MULTIPLE RESPNSE}
      98   941    4.2 {MISSING}

```

If byp29=16 then RELIG=0; else RELIG=1.

```
Variable[ 4631]:  BYP61BA  R ATTENDS CONCERTS/OTHER MUSICAL EVENTS
Code  Freq Percent  Label
1    13488    59.5 YES
2     8064    35.6 NO
6         3     0.0 {MULTIPLE RESPNSE}
8     1096     4.8 {MISSING}
```

If byp61ba=2 then CONCERTS=0; else CONCERTS=1.

```
-----
Variable[ 4633]:  BYP61CA  R GOES TO ART MUSEUMS
Code  Freq Percent  Label
1     8375    37.0 YES
2    12932    57.1 NO
6         2     0.0 {MULTIPLE RESPNSE}
8     1342     5.9 {MISSING}
```

If byp61ca=2 then MUSEUMS=0; else MUSEUMS=1.

```
-----
Variable[ 4635]:  BYP61DA  R GOES TO SCIENCE MUSEUMS
Code  Freq Percent  Label
1     9782    43.2 YES
2    11533    50.9 NO
6         1     0.0 {MULTIPLE RESPNSE}
8     1335     5.9 {MISSING}
```

If byp61da=2 then SCIENCE=0; else SCIENCE=1.

```
-----
Variable[ 4637]:  BYP61EA  R GOES TO HISTORY MUSEUMS
Code  Freq Percent  Label
1    10073    44.5 YES
2    11254    49.7 NO
6         3     0.0 {MULTIPLE RESPNSE}
8     1321     5.8 {MISSING}
```

If byp61ea=2 then HISTORY=0; else HISTORY=1.

CULTURE=CONCERTS+MUSEUMS+SCIENCE+HISTORY.

```
-----
Variable[ 4693]:  BYP76  HOW FAR IN SCHOOL R EXPECT CHILD TO GO
Code  Freq Percent  Label
01    104     0.5 LESS THN H.S DIPLOMA
02     42     0.2 GED
03   2637    11.6 HIGH SCHL GRADUATION
04    265     1.2 VOC,TRD,BUS < 1YR
05    814     3.6 VOC,TRD,BUS 1-2 YRS
06    695     3.1 VOC,TRD,2YRS OR MORE
07   1153     5.1 < 2YRS OF COLLEGE
08   2054     9.1 2 / MORE YRS COLLEGE
09   1059     4.7 FINISH A 2YR PROGRAM
10   8507    37.6 FINISH 4/5 YR PROG
11   2579    11.4 MASTER'S DEGREE
12   2602    11.5 PH.D., M.D.,
96     27     0.1 {MULTIPLE RESPNSE}
97     37     0.2 {REFUSAL}
98     76     0.3 {MISSING}
```

If byp76=1 or =2 then PAR_EXP=0; else if byp76=3 or =4 or =5 or =6 or =8 then PAR_EXP=1; else if byp76=7 or =9 or =10 then PAR_EXP=2; else if byp76=11 then PAR_EXP=3; else PAR_EXP=4.

```

-----
Variable[ 4528]:  BYP32    DURING THE PAST 4 WEEKS WERE YOU WORKING
      Code  Freq Percent      Label
      1  12859   56.8 YES, WORKING FULL-TM
      2   3376   14.9 YES, WORKING PART-TM
      3    594    2.6 HAVE A JOB NOT AT WK
      4   5723   25.3 NO
      6     8     0.0 {MULTIPLE RESPNSE}
      7    10     0.0 {REFUSAL}
      8    81     0.4 {MISSING}

```

```

-----
Variable[ 4533]:  BYP35    DURING PAST WEEK WAS SPOUSE WORKING
      Code  Freq Percent      Label
      1  4206   18.6 NO SPOUSE/PARTNER
      2 14400   63.6 YES, WORKING FULL-TM
      3  1089    4.8 YES, WORKING PART-TM
      4   441    1.9 HAVE A JOB NOT AT WK
      5  2353   10.4 NO
      6     9     0.0 {MULTIPLE RESPNSE}
      7    25     0.1 {REFUSAL}
      8   128     0.6 {MISSING}

```

If byp32=1 or =2 or =3 and byp35=2 or =3 or =4 then PARWORK=2; else if byp32=1 or =2 or =3 and byp35 not =2 or not =3 or not =4; then PARWORK=1; else if byp32 not =1 or not =2 or not =3 and byp35=2 or =3 or =4 then PARWORK=1; else PARWORK=0.

PARWORK2=PARWORK**2.

If byp32=4 and byp35=1 or =5 then UNEMPLOY=1; else UNEMPLOY=0.

If byp32=1 or =2 or =3 and byp35=2 or =3 or =4 then BOTHWORK=1; else BOTHWORK=0.

```

-----
Variable[ 4697]:  BYP80    TOTAL FAMILY INCOME FRM ALL SOURCES 1987
      Code  Freq Percent      Label
      01    94     0.4 NONE
      02   203     0.9 LESS THAN $1,000
      03   338     1.5 $1,000 - $2,999
      04   453     2.0 $3,000 - $4,999
      05   729     3.2 $5,000 - $7,499
      06   818     3.6 $7,500 - $9,999
      07  1794     7.9 $10,000 - $14,999
      08  1682     7.4 $15,000 - $19,999
      09  2130     9.4 $20,000 - $24,999
      10  3815    16.8 $25,000 - $34,999
      11  4301    19.0 $35,000 - $49,999
      12  3007    13.3 $50,000 - $74,999
      13   933     4.1 $75,000 - $99,999
      14   915     4.0 $100,000 - $199,999
      15   382     1.7 $200,000 OR MORE
      96     1     0.0 {MULTIPLE RESPNSE}
      97   796     3.5 {REFUSAL}
      98   260     1.1 {MISSING}

```

If byp80= 1 or =2 or =3 or =4 or =5 then FAMINC=3750; else if byp80=6 or =7 then FAMINC=11250; else if byp80=8 then FAMINC=17500; else if byp80=9 then

```

FAMINC=22500; else if byp80=10 then FAMINC=30000; else if byp80=11 then
FAMINC=42500; else if byp80=12 then FAMINC=62500; else if byp80=13 then
FAMINC=87500; else if byp80=14 then FAMINC=150000; else FAMINC=250000.

```

```

FAMINC=FAMINC*(1.03)**9.

```

Drug and alcohol problems

```

-----
Variable[ 4897]:  F2P38H  TEEN STOPD ATND SCHL- DRUG/ALCOHOL PRBLM
Code  Freq Percent      Label
1      172      1.0 YES
2     1448      8.2 NO
3       68      0.4 DON^T KNOW
{blank} 1215      6.9 {NO PARENT QUEX}
8       294      1.7 {MISSING}
9    14413     81.8 {LEGITIMATE SKIP}

```

```

-----
Variable[ 2481]:  F2D9AU  I HAD A DRUG/ALCOHOL PROBLEM
Code  Freq Percent      Label
1      101      5.0 YES
2     1801     88.8 NO
7       2       0.1 {REFUSED}
8      124      6.1 {MISSING}

```

```

Variable[ 1545]:  F2S82  # TIMES R HAD 5 DRINKS OR MORE IN A ROW
Code  Freq Percent      Label
0    11141     52.6 NONE
1     1742      8.2 ONCE
2     1111      5.2 TWICE
3      968      4.6 3-5 TIMES
4      312      1.5 6-9 TIMES
5      338      1.6 10 OR MORE TIMES
{blank} 3996     18.9 {NONRESPONDENTS & DROPOUTS}
8     1580      7.5 {MISSING}

```

```

-----
Variable[ 2847]:  F2D72  5 OR MORE DRINKS IN LAST 2 WEEKS
Code  Freq Percent      Label
01    1305     64.3 NONE
02     186      9.2 ONCE
03     138      6.8 TWICE
04     167      8.2 3 TO 5 TIMES
05      45      2.2 6 TO 9 TIMES
06      64      3.2 10 OR MORE TIMES
96       1      0.0 {MULTIPLE RESPNSE}
97       1      0.0 {REFUSED}
98     121      6.0 {MISSING}

```

```

-----
Variable[ 1548]:  F2S83C  LAST 30 DAYS, # TIMES USED MARIJUANA
Code  Freq Percent      Label
0    12455     58.8 0 OCCASIONS
1      798      3.8 1-2 OCCASIONS
2      457      2.2 3-19 OCCASIONS
3      223      1.1 20+ OCCASIONS
{blank} 3996     18.9 {NONRESPONDENTS & DROPOUTS}
6       1      0.0 {MULT RESPONSE}
8     2558     12.1 {MISSING}
9      700      3.3 {LEGITIMATE SKIP}

```

```

Variable[ 2850]:  F2D73C  # TIMES LAST 30 DAYS R USED MARIJUANA
Code  Freq Percent  Label
0    1479   72.9 0 OCCASIONS
1     115    5.7 1-2 OCCASIONS
2      83    4.1 3-19 OCCASIONS
3      51    2.5 20+ OCCASIONS
6       1    0.0 {MULTIPLE RESPNSE}
7       2    0.1 {REFUSED}
8     246   12.1 {MISSING}
9      51    2.5 {LEGITIMATE SKIP}

```

```

-----
Variable[ 1551]:  F2S84C  LAST 30 DAYS, # OF TIMES TAKEN COCAINE
Code  Freq Percent  Label
0    13775   65.0 0 OCCASIONS
1      66    0.3 1-2 OCCASIONS
2      38    0.2 3-19 OCCASIONS
3      42    0.2 20+ OCCASIONS
{blank} 3996   18.9 {NONRESPONDENTS & DROPOUTS}
8     2435   11.5 {MISSING}
9      836    3.9 {LEGITIMATE SKIP}

```

```

-----
Variable[ 2853]:  F2D74C  # TIMES LAST 30 DAYS R USED COCAINE
Code  Freq Percent  Label
0    1688   83.2 0 OCCASIONS
1      22    1.1 1-2 OCCASIONS
2       8    0.4 3-19 OCCASIONS
3       3    0.1 20+ OCCASIONS
6       1    0.0 {MULTIPLE RESPNSE}
7       2    0.1 {REFUSED}
8     237   11.7 {MISSING}
9      67    3.3 {LEGITIMATE SKIP}

```

If f2p38h=1 or f2d9au=1 or f2s82=2 or =3 or =4 or =5 or f2d72=2 or =3 or =4 or =5 or f2s83c=1 or =2 or =3 or f2d73c=1 or =2 or =3 or f2s84c=1 or =2 or =3 or f2d74c=1 or =2 or =3 then DA_PROB=1; else DA_PROB=0.

Sexual activity

```

-----
Variable[ 1527]:  F2S74  IMPORTANT TO BE MARRIED BEFORE SEX
Code  Freq Percent  Label
1     7236   34.2 NOT IMPORTANT
2     5304   25.0 SOME IMPORTANCE
3     2949   13.9 VERY IMPORTANT
{blank} 3996   18.9 {NONRESPONDENTS & DROPOUTS}
6       2    0.0 {MULT RESPONSE}
8     1701    8.0 {MISSING}

```

```

-----
Variable[ 2827]:  F2D64  IMPORTANT TO MARRY BEFORE HAVING SEX
Code  Freq Percent  Label
1     868   42.8 NOT IMPORTANT
2     731   36.0 SOMEWHAT IMPRTNT
3     292   14.4 VERY IMPORTANT
6       1    0.0 {MULTIPLE RESPNSE}
7       1    0.0 {REFUSED}
8     135    6.7 {MISSING}

```

```

Variable[ 1528]:  F2S75  CONSIDER HAVING A CHILD BEFORE MARRIAGE
      Code  Freq Percent      Label
      1    2393    11.3  YES
      2    3226    15.2  MAYBE
      3    8962    42.3  NO
      4    1007     4.8  DON^T KNOW
{blank}  3996    18.9  {NONRESPONDENTS & DROPOUTS}
      8    1604     7.6  {MISSING}

```

```

-----
Variable[ 2828]:  F2D65  CONSIDER HAVING CHILD AND NOT BE MARRIED
      Code  Freq Percent      Label
      1     718    35.4  NO
      2     347    17.1  MAYBE
      3     712    35.1  YES
      4     112     5.5  DON^T KNOW
      7        1     0.0  {REFUSED}
      8     138     6.8  {MISSING}

```

```

-----
Variable[ 1529]:  F2S76  R HAVE ANY CHILDREN OF HIS/HER OWN
      Code  Freq Percent      Label
      1     486     2.3  YES, I DO
      2  16229    76.6  NO, I DON^T
      3     237     1.1  NO,BUT EXPECTING
{blank}  3996    18.9  {NONRESPONDENTS & DROPOUTS}
      7      16     0.1  {REFUSED}
      8     224     1.1  {MISSING}

```

```

-----
Variable[ 2829]:  F2D66  DOES R HAVE ANY CHILDREN
      Code  Freq Percent      Label
      1    1223    60.3  NO, I DON^T
      2     145     7.1  NO, EXPECT ONE
      3     616    30.4  YES, I DO
      7        2     0.1  {REFUSED}
      8      42     2.1  {MISSING}

```

```

-----
Variable[ 4892]:  F2P38C  TEEN STOPD ATND SCHL- TEEN BECAME PARENT
      Code  Freq Percent      Label
      1     318     1.8  YES
      2    1353     7.7  NO
      3      19     0.1  DON^T KNOW
{blank}  1215     6.9  {NO PARENT QUEX}
      6        1     0.0  {MULTIPLE RESPNSE}
      8     291     1.7  {MISSING}
      9   14413    81.8  {LEGITIMATE SKIP}

```

```

-----
Variable[ 4896]:  F2P38G  TEEN STOPD ATND SCHL- GOT MARRIED
      Code  Freq Percent      Label
      1     188     1.1  YES
      2    1485     8.4  NO
      3      15     0.1  DON^T KNOW
{blank}  1215     6.9  {NO PARENT QUEX}
      8     294     1.7  {MISSING}
      9   14413    81.8  {LEGITIMATE SKIP}

```

If f2s74=1 or =2 or f2d65=1 or =2 or f2s76=1 or =3 or f2d66=2 or =3 or f2p38c=1 or f2p38g=1 then SEX_RISK=1, else SEX_RISK=0.

Criminal activity

```

-----
Variable[ 1135]:  F2S9H   HOW MANY TIMES R WAS ARRESTED
      Code  Freq Percent   Label
      0  16312   77.0 NEVER
      1    452    2.1 1-2 TIMES
      2    61    0.3 3-6 TIMES
      3    12    0.1 7-9 TIMES
      4     6    0.0 10-15 TIMES
      5    34    0.2 OVER 15 TIMES
{blank}  3996   18.9 {NONRESPONDENTS & DROPOUTS}
      8    315    1.5 {MISSING}

```

```

-----
Variable[ 2517]:  F2D19H   I WAS ARRESTED
      Code  Freq Percent   Label
      00  1725   85.1 NEVER
      01   143    7.1 1-2 TIMES
      02    30    1.5 3-6 TIMES
      03     8    0.4 7-9 TIMES
      04     1    0.0 10-15 TIMES
      05     5    0.2 OVER 15 TIMES
      98   116    5.7 {MISSING}

```

```

-----
Variable[ 1136]:  F2S9I   TIMES R SPENT TIME IN JUVENILE CNTR
      Code  Freq Percent   Label
      0  16710   78.9 NEVER
      1   122    0.6 1-2 TIMES
      2    21    0.1 3-6 TIMES
      3    11    0.1 7-9 TIMES
      4     2    0.0 10-15 TIMES
      5    28    0.1 OVER 15 TIMES
{blank}  3996   18.9 {NONRESPONDENTS & DROPOUTS}
      8   298    1.4 {MISSING}

```

```

-----
Variable[ 2518]:  F2D19I   SPENT TIME IN JUVENILE HOME/DETENTION
      Code  Freq Percent   Label
      00  1769   87.2 NEVER
      01   106    5.2 1-2 TIMES
      02    17    0.8 3-6 TIMES
      03    10    0.5 7-9 TIMES
      04     4    0.2 10-15 TIMES
      05     8    0.4 OVER 15 TIMES
      98   114    5.6 {MISSING}

```

If f2s9h=2 or =3 or =4 or =5 or f2d19h=2 or =3 or =4 or =5 or f2s9i=2 or =3 or =4 or =5 or f2d19i=2 or =3 or =4 or =5 then CRIMINAL=1; else if f2s9h=1 and f2s9i=1 then CRIMINAL=1; else if f2d19h=1 and f2d19i=1 then CRIMINAL=1; else CRIMINAL=0.

Gang and anti-social behavior

```

-----
Variable[ 4885]:  F2P35A   TEEN EVER HAD BEHAVIOR PROBLEM AT SCHL
      Code  Freq Percent   Label
      1  1602    9.1 YES
      2 14587   82.8 NO
{blank} 1215    6.9 {NO PARENT QUEX}
      6     1    0.0 {MULTIPLE RESPNSE}
      8   205    1.2 {MISSING}

```

```

Variable[ 4887]:  F2P35C  TEEN EVER BEEN EXPELLED FROM SCHOOL
  Code  Freq Percent  Label
    1    463     2.6 YES
    2  15471    87.9 NO
{blank}   1215     6.9 {NO PARENT QUEX}
    8     461     2.6 {MISSING}

```

```

-----
Variable[ 1133]:  F2S9F  HOW MANY TIMES R SUSPENDED FROM SCHOOL
  Code  Freq Percent  Label
    0  15910    75.1 NEVER
    1   786     3.7 1-2 TIMES
    2   117     0.6 3-6 TIMES
    3    30     0.1 7-9 TIMES
    4     8     0.0 10-15 TIMES
    5    41     0.2 OVER 15 TIMES
{blank}  3996    18.9 {NONRESPONDENTS & DROPOUTS}
    6     1     0.0 {MULT RESPONSE}
    8   299     1.4 {MISSING}

```

```

-----
Variable[ 2515]:  F2D19F  I WAS SUSPENDED OR PUT ON PROBATION
  Code  Freq Percent  Label
   00  1362    67.2 NEVER
   01   339    16.7 1-2 TIMES
   02   122     6.0 3-6 TIMES
   03    24     1.2 7-9 TIMES
   04    22     1.1 10-15 TIMES
   05    45     2.2 OVER 15 TIMES
   98   114     5.6 {MISSING}

```

```

-----
Variable[ 1134]:  F2S9G  R TRANSFERRED FOR DISCIPLINARY REASONS
  Code  Freq Percent  Label
    0  16732    79.0 NEVER
    1   111     0.5 1-2 TIMES
    2    15     0.1 3-6 TIMES
    3    12     0.1 7-9 TIMES
    4     3     0.0 10-15 TIMES
    5    20     0.1 OVER 15 TIMES
{blank}  3996    18.9 {NONRESPONDENTS & DROPOUTS}
    8   299     1.4 {MISSING}

```

```

-----
Variable[ 2516]:  F2D19G  TRANSFERRED FOR DISCIPLINE REASONS
  Code  Freq Percent  Label
   00  1826    90.0 NEVER
   01    78     3.8 1-2 TIMES
   02     5     0.2 3-6 TIMES
   03     1     0.0 7-9 TIMES
   05     3     0.1 OVER 15 TIMES
   98   115     5.7 {MISSING}

```

```

-----
Variable[ 1520]:  F2S71  DOES R BELONG TO A GANG
  Code  Freq Percent  Label
    1   431     2.0 YES
    2  14404    68.0 NO
{blank}  3996    18.9 {NONRESPONDENTS & DROPOUTS}
    8   2357    11.1 {MISSING}

```



```
Variable[ 2820]: F2D61B DOES R BELONG TO A GANG
  Code  Freq Percent  Label
    1      85    4.2 YES
    2   1719   84.8 NO
    7      1    0.0 {REFUSED}
    8   223   11.0 {MISSING}
```

```
If f2p35a=1 or f2p35c=1 or f2s9f=2 or =3 or =4 or =5 or f2d19f=02 or =03 or =04
or =05 or f2s9g=2 or =3 or =4 or =5 or f2d19g=02 or =03 or =04 or =05 or f2s71=1
or f2d61b=1 then GANG=1; else GANG=0.
```

```
Control variable for school dropouts
```

```
If f2evdost=1 then DROPOUT=1; else DROPOUT=0.
```

APPENDIX B

Identification and Frequency Listing of the Variables
Used in the Study.

Variable for the amount of time the child lives with the father.

DADHOUSE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2556	23.3	2556	23.3
1	8434	76.7	10990	100.0

Variable for the amount of time the child lives with the mother.

MOMHOUSE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	570	5.2	570	5.2
1	10420	94.8	10990	100.0

Variable for the amount of time the child lives with a parent or guardian.

TIMELIVE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	82	0.7	82	0.7
1	202	1.8	284	2.6
2	10706	97.4	10990	100.0

Variable for how often the parent or parents discuss school with the child.

TALK_SCH	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	258	2.3	258	2.3
1	1872	17.0	2130	19.4
2	8860	80.6	10990	100.0

Variable for how often the parent or parents discuss high school plans with the child.

TLKPLAN1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1003	9.1	1003	9.1
1	4972	45.2	5975	54.4
2	5015	45.6	10990	100.0

Variable for how often the parent or parents discuss post high school plans with the child.

TLKPLAN2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1405	12.8	1405	12.8
1	5463	49.7	6868	62.5
2	4122	37.5	10990	100.0

Variable for how often the mother is at home when the child gets home from school.

MOM_ASCH	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2987	27.2	2987	27.2
1	8003	72.8	10990	100.0

Variable for how often the father is at home when the child gets home from school.

DAD_ASCH	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	6559	59.7	6559	59.7
1	4431	40.3	10990	100.0

Variable for whether the student has a specific place to study.

STU_PLAS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	6525	59.4	6525	59.4
1	4465	40.6	10990	100.0

Variable for how often the parent or parents attend a school activity at the child's school.

PAR_ATTD	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	3523	32.1	3523	32.1
1	7467	67.9	10990	100.0

Variable for whether the parent or parents set rules on the type of television programs the child may watch.

TVPROGRM	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	3443	31.3	3443	31.3
1	7547	68.7	10990	100.0

Variable for whether the parent or parents set rules on how late the child can watch television.

TVLATE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1772	16.1	1772	16.1
1	9218	83.9	10990	100.0

Variable for whether the parent or parents set rules on how many hours of television the child can watch.

TVHOURS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	6587	59.9	6587	59.9
1	4403	40.1	10990	100.0

Variable for whether the parent or parents set a minimum grade point average that the child must maintain.

MAINTGPA	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	3269	29.7	3269	29.7
1	7721	70.3	10990	100.0

Variable for whether the parent or parents regulate homework the school assigns to the child.

HW_RULE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1009	9.2	1009	9.2
1	9981	90.8	10990	100.0

Variable for whether the parent or parents require the child to do regular chores.

DOCHORES	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1287	11.7	1287	11.7
1	9703	88.3	10990	100.0

Variable for how often the parent or parents help the child with homework.

HELP_HW	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	3210	29.2	3210	29.2
1	3252	29.6	6462	58.8
2	4528	41.2	10990	100.0

Variable asking the child how often his or her parent or parents help with homework.

HWRK_HLP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	6181	56.2	6181	56.2
1	4809	43.8	10990	100.0

Variable asking the child how often his or her parent or parents limit the time he or she can go out with friends.

LIM_FREN	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2853	26.0	2853	26.0
1	8137	74.0	10990	100.0

Variable for whether the home has an encyclopedia.

ENCYCLO	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1993	18.1	1993	18.1
1	8997	81.9	10990	100.0

Variable for whether the home has an atlas.

ATLAS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2960	26.9	2960	26.9
1	8030	73.1	10990	100.0

Variable for whether the home has a dictionary.

DICTION	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	166	1.5	166	1.5
1	10824	98.5	10990	100.0

Variable for whether the home has a calculator.

CALCULAT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	419	3.8	419	3.8
1	10571	96.2	10990	100.0

Variable for whether the home has more than fifty books.

BOOKS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	938	8.5	938	8.5
1	10052	91.5	10990	100.0

Variable for how often the family attends concerts.

CONCERTS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	7225	65.7	7225	65.7
1	3765	34.3	10990	100.0

Variable for how often the family visits museums.

MUSEUMS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	4346	39.5	4346	39.5
1	6644	60.5	10990	100.0

Variable for how often the family visits science exhibits.

SCIENCE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5286	48.1	5286	48.1
1	5704	51.9	10990	100.0

Variable for how often the family visits history museums.

HISTORY	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5467	49.7	5467	49.7
1	5523	50.3	10990	100.0

Variable for the average educational attainment of the parents.

PAR_EDUC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	818	7.4	818	7.4
0.5	857	7.8	1675	15.2
1	3720	33.8	5395	49.1
1.5	1308	11.9	6703	61.0
2	1283	11.7	7986	72.7
2.5	821	7.5	8807	80.1
3	937	8.5	9744	88.7
3.5	704	6.4	10448	95.1
4	542	4.9	10990	100.0

Variable for whether a sibling of the child has dropped out of school.

DROP_SIB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	10149	92.3	10149	92.3
1	577	5.3	10726	97.6
2	150	1.4	10876	99.0
3	55	0.5	10931	99.5
4	27	0.2	10958	99.7
5	20	0.2	10978	99.9
6	12	0.1	10990	100.0

Variable for whether the child's parents are married to each other.

MARRIED	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1829	16.6	1829	16.6
1	9161	83.4	10990	100.0

Variable for whether the family observes any religious practices.

RELIG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	260	2.4	260	2.4
1	10730	97.6	10990	100.0

Variable for how often the family attends concerts.

CONCERTS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	7225	65.7	7225	65.7
1	3765	34.3	10990	100.0

Variable for how often the family visits museums.

MUSEUMS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	4346	39.5	4346	39.5
1	6644	60.5	10990	100.0

Variable for how often the family visits science exhibits.

SCIENCE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5286	48.1	5286	48.1
1	5704	51.9	10990	100.0

Variable for how often the family visits history museums.

HISTORY	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	5467	49.7	5467	49.7
1	5523	50.3	10990	100.0

Variable for what the parental expectations for the educational attainment of the child are.

PAR_EXP	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	50	0.5	50	0.5
1	2801	25.5	2851	25.9
2	5490	50.0	8341	75.9
3	1382	12.6	9723	88.5
4	1267	11.5	10990	100.0

Variable for whether the parent or parents are working.

PAR_WORK	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	553	5.0	553	5.0
0.5	2777	25.3	3330	30.3
1	7660	69.7	10990	100.0

Variable for family income.

	FAMINC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	x=0	94	0.43	94	0.43
2	0<x<1000	203	0.94	297	1.37
3	1000<x<2999	338	1.56	635	2.94
4	3000<x<4999	453	2.09	1088	5.03
5	5000<x<7499	729	3.37	1817	8.41
6	7500<x<9999	818	3.78	2635	12.20
7	10000<x<14999	1794	8.30	4429	20.51
8	15000<x<19999	1682	7.78	6111	28.29
9	20000<x<24999	2130	9.86	8241	38.16
10	25000<x<34999	3815	17.66	12056	55.83
11	35000<x<49999	4301	19.91	16357	75.74
12	50000<x<74999	3007	13.92	19364	89.67
13	75000<x<99999	933	4.32	20297	93.99
14	100000<x<199999	915	4.23	21212	98.23
15	x>200000	382	1.76	21594	100.00

Variable for whether youth have a drug and/or alcohol problem.

	DA_PROB	Frequency	Percent	Cumulative Frequency	Cumulative Percent
	0	8480	77.2	8480	77.2
	1	2510	22.8	10990	100.0

Variable for whether youth are sexually active.

	SEX_RISK	Frequency	Percent	Cumulative Frequency	Cumulative Percent
	0	2007	18.3	2007	18.3
	1	8983	81.7	10990	100.0

Variable for whether youth are criminally active.

	CRIMINAL	Frequency	Percent	Cumulative Frequency	Cumulative Percent
	0	10851	98.7	10851	98.7
	1	139	1.3	10990	100.0

Variable for whether youth exhibit anti-social behavior.

	GANG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
	0	9827	89.4	9827	89.4
	1	1163	10.6	10990	100.0

Variable to integrate information on school dropouts into the study.

DROPOUT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	9999	91.0	9999	91.0
1	991	9.0	10990	100.0

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Dalton H. Garis received his Bachelor of Science in industrial engineering and operations research from the University of Massachusetts at Amherst in 1984. He worked in the retail food industry as an industrial engineer performing work methods analysis and economic analysis before earning a Master of Science in agricultural economics from Texas A & M University in 1989. That same year he received a United States Department of Agriculture National Needs Fellowship in Agribusiness Marketing to study for the Doctor of Philosophy degree at the University of Florida.

Mr. Garis has done research in Poland on the dairy industry and lectured extensively in Poland on dairy marketing orders and the retail marketing of dairy products. He performed research for the Florida Department of Citrus in Ukraine on the market for Florida citrus products. He lectured on marketing orders and other agricultural economic topics at institutes in Kiev, Kherson and Odessa.

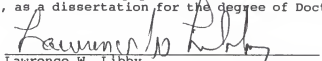
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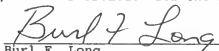
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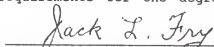
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This dissertation was submitted to the Graduate Faculty of the College of Agriculture and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.


Dean, College of Agriculture

Dean, Graduate School